

UTAH DEPARTMENT OF TRANSPORTATION

Guidelines for Crash Cushions & Barrier End Treatments

APPROVED PRODUCTS LIST

PREPARED BY THE DIVISION OF TRAFFIC & SAFETY

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UDOT Guidelines for Crash Cushion and Barrier End Treatments

INTRODUCTION

March 19, 2012

UDOT had adopted NCHRP 350 testing Basic TL-3 as the standard for crash cushions and barrier end treatments for permanent and work zone applications. Testing under NCHRP 350 criteria was done using a minimum of two types of production model vehicles, a small car and a pickup truck at a nominal speed of 62 mph (100 km/h). Each device or system had to pass a minimum number of tests in order to receive FHWA approval as a compliant system. More information about the testing requirements can be found in NCHRP Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features.

In October 2009 AASHTO and FHWA accepted the Manual for Assessing Safety Hardware (MASH), as the criteria for testing crash cushions and barrier end treatments as well as other safety hardware. The most significant changes made within the MASH testing criteria were made based on the changes made in the vehicle fleet. Vehicles have increased in weight and light truck bumper heights have risen. The basic test levels have remained the same for the MASH testing. More information about the testing requirements can be found in the AASHTO Manual for Assessing Safety Hardware (MASH), 2009. New products submitted to FHWA for approval after January 1, 2011 will be required to meet the MASH testing criteria.

On June 30, 2011 a proposal was made to the Utah Department of Transportation Standards Committee to also accept the Manual for Assessing Safety Hardware as the criteria for accepting crash cushions and end treatments. The Standards Committee, on that date, did accept the Manual for Assessing Safety Hardware as the criteria for accepting crash cushions and barrier end treatments for permanent installation. The Standards Committee also approved the continued use of previously approved crash cushions and barrier end treatments for permanent installation that met NCHRP 350 requirements and were approved for use by the Department before June 30, 2011. All crash cushions or barrier end treatments intended for permanent installation that were not approved by the Department before June 30, 2011 will have to meet the requirements of the AASHTO Manual for Assessing Safety Hardware (MASH), 2009.

All systems listed in this guide for permanent installation have been approved for use on the State and National Highway Systems before January 1, 2011 and are NCHRP 350 or MASH compliant. Refer to Summary Tables for approval status.

A designer may designate any one system for a project when there is a choice of more than one system but must submit a letter of public interest explaining why this is the preferred system. The letter will be sent to the Traffic & Safety Operations Engineer, Division of Traffic & Safety. The Traffic & Safety Operations Engineer will forward it, with recommendation, to the Federal Highway Administration for approval. The approved letter will be placed in the project file.

These guidelines will list the type of crash cushion or barrier end treatment, a brief description, application, and the manufacturer's name with the local supplier identified.

Systems identified, as construction zone systems will not be used in a permanent application without prior approval from the Traffic & Safety Operations Engineer, Division of Traffic & Safety.

General System Information

Each approved crash cushion or end treatment will have the following information:

NCHRP 350 or MASH Test Level: the level a system has passed required testing.

TL-1 \leq 30 MPH

TL-2 \leq 45 MPH,

* TL-2 + \geq 50 MPH (Utah designation)

TL-3 \geq 60 MPH

* **Some of the systems in the Crash Cushion Types A, B, and D can be configured to meet varying design speed criteria. Systems which can be configured for speed greater than 45 MPH but less than 60 MPH will have a TL-2 + designation in this Guide.**

Some manufacturers offer systems that exceed TL-3, FHWA does not require the use of systems that exceed TL-3.

Designers will not specify higher speed systems for installation.

Suppliers will bid only systems to the capacity as designated in these Guidelines.

Crash Cushion Type C systems are TL- 3 systems.

End Treatments Type F, G and H are TL-3 systems.

Type E, sand barrel arrays will be configured to meet the design speed of the roadway they are being place on. If a roadway has a speed increase, modification to the sand barrel array should be made to meet the higher speed requirement.

The following are definitions that will help in choosing the proper system for the proper application.

Length: the length of the system based on the speed of the facility and the width of hazard.

Width: width design varies between manufacturers, some supplying standard width and others using custom design. Those systems with a width designation (ie: 30"), this is the inside measurement of the system and the maximum hazard width the system can protect. Two systems, TRACC and SCI, use additional transition type panels to obtain the required width. Caution should be used when these systems are supplied to insure the required approach to the system is maintained.

LON: Length Of Need indicates that portion of the system that can be included as part of the barrier LON requirement.

Characteristics: the manner in which the system has been designed to perform.

Application: a statement that lists some of the appropriate uses, requirements and Standard Drawings applicable to the system.

Requirements: conditions needed to insure proper operation of the system. Special requirements may be needed to handle drainage, or specific grading requirements for the systems. If there are special circumstance or requirements contact the Traffic & Safety Operations Engineer.

Offset: (guardrail approved systems) the distance from the lateral distance of the barrier line, extended to the front of the system.

INTRODUCTION TO SYSTEM TYPES AND DESCRIPTION

Systems listed in this Guideline have been developed using FHWA Roadside Hardware web site (http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/barriers/term_cush.cfm) and the 2011 edition of the Roadside Design Guide, as a guide for Type classification.

FHWA did not define the classification using a fixed numbered width. These Guidelines have established a fixed number to separate Types A and B by width. A Type B narrow system can be configured to a type A wide system with additional transition panels added to the system to increase the system width.

Type D systems have an FHWA and Roadside Design Guide designation as low maintenance and/or self-restoring. These Guidelines have accepted this category.

Type C systems have an FHWA and Roadside Design Guide designation as median w-beam terminals. This guide designates these systems as crash cushions.

Type F systems have an FHWA and Roadside Design Guide designation sacrificial crash cushions. This guide designates these systems as concrete barrier end treatments.

FHWA and Roadside Design Guide have categorized w-beam terminals in a single category. This guide separates these systems into two types: Type G Tangent End Treatments and Type H Flared End Treatments.

The FHWA web site and the 2011 Roadside Design Guide have additional systems listed and approved.

The Utah Department of Transportation has reviewed systems as submitted and has determined the systems listed in these Guidelines are systems that best meets the Departments needs. All crash cushion and end treatments listed in these Guidelines are proprietary systems.

A non-proprietary guardrail end treatment not listed in this guide, the Buried-in-Backslope (Std. Dwg. Drawings BA 4F series) should be considered when flaring w-beam barrier off the roadway.

Summary Table of Approved Crash Cushions for Permanent Application

CRASH CUSHIONS				
<p>Type A: SYSTEMS OF THIS TYPE HAVE BEEN CLASSIFIED BY FHWA AND THE AASHTO ROADSIDE DESIGN GUIDE AS REUSABLE CRASH CUSHIONS.</p> <p>PRIMARILY TO PROTECT FIXED HAZARDS, GREATER THAN 36 INCHES WIDE, WITH LIMITED RECOVERY AREA OR POINT HAZARDS. THESE SYSTEMS ARE NON-GATING. SYSTEMS OF THIS TYPE MAY BE USED AS STAND ALONE SYSTEMS ON SHOULDER APPLICATIONS FOR THE PROTECTION OF POINT HAZARDS (IE, SIGN FOUNDATIONS) WHEN A COST ANALYSIS DETERMINES IT MORE COST EFFECTIVE TO INSTALL THIS TYPE OF SYSTEM THAN TO INSTALL ADDITIONAL BARRIER. USE IN GORE AREAS AND MEDIAN APPLICATION TO PROTECT ENDS OF MEDIAN BARRIER WHEN BIDIRECTIONAL TRAFFIC IS PRESENT AND THE SITE GEOMETRY IS SUCH THAT FREQUENT IMPACTS ARE NOT ANTICIPATED. THESE SYSTEMS CAN BE USED ON LIMITED BASIS IN A SHOULDER APPLICATION FOR THE PROTECTION OF BARRIER ENDS WHEN THE APPROACH AREA AND RECOVERY AREA FOR AN APPROVED END TREATMENT CANNOT BE PROVIDED. DO NOT REDUCE LENGTH OF NEED REQUIREMENTS WHEN THERE IS ROADSIDE RECOVERY AREA AVAILABLE. APPLICATION SHOULD MEET THE REQUIREMENTS OF THE APPLICABLE CC SERIES STANDARD DRAWING.</p> <p style="text-align: center;">DESIGNERS WILL DESIGNATE HAZARD WIDTH ON PLAN SET</p>				
System Name	Manufacturer	NCHRP Test Level FHWA Approval	MASH Test Level FHWA Approval	Comments
QuadGuard M10 wide	Trinity Highway Products, Inc. Energy Absorption Systems		TL- 2 TL-3 FHWA CC-112 February 9, 2011	This system is available in two standard widths, 69 inches and 90 inches. Manufacturer can design wider system upon request. System uses an enhanced crushable cartridge than the other QuadGuard systems, cartridge designated with marking of Type M-I or Type M-II
QuadGuard II wide	Trinity Highway Products, Inc. Energy Absorption Systems	TL- 2, TL 2+ TL-3 FHWA CC-351 March 20, 2009	None	This system is available in two standard widths, 69 inches and 90 inches. Manufacturer can design wider system upon request. System uses an typical QuadGuard crushable cartridge designated with marking of Type I or Type II
SCI100GM and SCI 70GM	Work Area Protection	TL - 3 TL - 2 FHWA CC-85 series Sept 12, 2003 Low Maintenance	None	This system protects a hazard up to 27 inches in width as standard, requires additional system specific transition panels to obtain widths greater than 27 inches. Transition panels are used to widen the system to meet hazard width, which adds length to the system. The additional transition panels will be considered as part of the system and will be included as part of the system bid price. See system description for specific details.
TRACC and ShortTRACC wide systems	Trinity Highway Products, Inc.	TL- 3 TL- 2 FHWA CC-54 series Nov 13, 1998	None	This system protects a hazard up to 4 ft. 10 inches in width in standard width designs, requires additional system specific extension panels to obtain widths greater than 4 ft. 10 inches. Extension panels required to meet hazard width will be considered as part of the system and will be included as part of the system bid price. See system description for specific details.
Universal TAU II wide systems	Barrier Systems Inc.	TL- 2, TL 2+ TL-3 FHWA CC-75 series Oct 14, 2001	None	This system is available in standard widths ranging from 42 inches to 96 inches. Manufacturer can design wider system upon request. Systems greater than 60" require dual cartridges placed side by side.

Type B: SYSTEMS OF THIS TYPE HAVE BEEN CLASSIFIED BY FHWA AND THE AASHTO ROADSIDE DESIGN GUIDE AS REUSABLE CRASH CUSHIONS.

PRIMARILY TO PROTECT FIXED HAZARDS, LESS THAN OR EQUAL TO 36 INCHES WIDE, WITH LIMITED RECOVERY AREA OR POINT HAZARDS. THESE SYSTEMS ARE NON-GATING. SYSTEMS OF THIS TYPE MAY BE USED AS STAND ALONE SYSTEMS ON SHOULDER APPLICATIONS FOR THE PROTECTION OF POINT HAZARDS (IE., SIGN FOUNDATIONS) WHEN A COST ANALYSIS DETERMINES IT MORE COST EFFECTIVE TO INSTALL THIS TYPE OF SYSTEM THAN TO INSTALL ADDITIONAL BARRIER. USE IN GORE AREAS AND MEDIAN APPLICATION TO PROTECT ENDS OF MEDIAN BARRIER WHEN BIDIRECTIONAL TRAFFIC IS PRESENT AND THE SITE GEOMETRY IS SUCH THAT FREQUENT IMPACTS ARE NOT ANTICIPATED. THESE SYSTEMS CAN BE USED ON LIMITED BASIS IN A SHOULDER APPLICATION FOR THE PROTECTION OF BARRIER ENDS WHEN THE APPROACH AREA AND RECOVERY AREA FOR AN APPROVED END TREATMENT CANNOT BE PROVIDED. DO NOT REDUCE LENGTH OF NEED REQUIREMENTS WHEN THERE IS ROADSIDE RECOVER AREA AVAILABLE. APPLICATION SHOULD MEET THE REQUIREMENTS OF THE APPLICABLE CC SERIES STANDARD DRAWING.

DESIGNERS WILL DESIGNATE HAZARD WIDTH ON PLAN SET

System Name	Manufacturer	NCHRP Test Level FHWA Approval	MASH Test Level FHWA Approval	Comments
QuadGuard M10	Trinity Highway Products, Inc. Energy Absorption Systems		TL- 2 TL-3 FHWA CC-112 February 9, 2011	This system is available in three standard widths 24 inch, 30 inch, and 36 inch. The standard width of 24 inches can protect narrower hazards than the 24 inch standard when positioned correctly in front of hazard. System uses an enhanced crushable cartridge than the other QuadGuard systems, cartridge designated with marking of Type M-I or Type M-II
QuadGuard II	Trinity Highway Products, Inc. Energy Absorption Systems	TL- 2, TL 2+ TL-3 FHWA CC-351 March 20, 2009	None	This system is available in three standard widths 24 inch, 30 inch, and 36 inch. The standard width of 24 inches can protect narrower hazards than the 24 inch standard when positioned correctly in front of hazard.
Quest 70/100	Trinity Highway Products, Inc. Energy Absorption Systems	TL- 2, TL 2+ TL-3 FHWA CC-87 Feb 17, 2005	None	Standard size 24". Requires additional transition panels to obtain widths greater than 24". Transition will be considered as part of the system and will be included as part of the bid price. The standard width of 24 inches can protect narrower hazards than the 24 inch standard when positioned correctly in front of hazard.
SCI100GM (TL-3) and SCI 70GM (TL-2)	Work Area Protection	TL- 2 & TL-3 FHWA CC-87 Feb 17, 2005 Low Maintenance	None	Standard size 27 inches. Requires additional transition panels to obtain widths greater than 27 inches. Transition will be considered as part of the system and will be included as part of the bid price. The standard width of 27 inches can protect narrower hazards than the 27 inch standard when positioned correctly in front of hazard.
TRACC (TL-3) and ShortTRACC (TL-2)	Trinity Highway Products, Inc.	TL- 2 TL- 3 FHWA CC-54 series Nov 13, 1998	None	Standard size 24 inches. Requires additional transition panels to obtain widths greater than 24 inches. Transition will be considered as part of the system and will be included as part of the bid price. The standard width of 24 inches can protect narrower hazards than the 24 inch standard when positioned correctly in front of hazard.
Universal TAU II	Barrier Systems Inc.	TL- 2, TL 2+ TL-3 FHWA CC-75 series Oct 14, 2001	None	This system is available in two standard widths 30 inch and 36 inch. Requires additional transition panels to obtain widths greater than 30 inches. Transition will be considered as part of the system and will be included as part of the bid price. The standard width of 30 inches can protect narrower hazards than the 30 inch standard when positioned correctly in front of hazard.

Type C: SYSTEMS OF THIS TYPE HAVE BEEN CLASSIFIED BY FHWA AND THE AASHTO ROADSIDE DESIGN GUIDE AS W-BEAM MEDIAN TERMINAL

PRIMARILY TO PROTECT NARROW HAZARDS, 24 INCHES OR LESS WITH AVAILABLE RECOVERY AREA. THESE SYSTEMS ARE GATING. TYPICALLY USED WITH MEDIAN W-BEAM GUARDRAIL OR CONCRETE MEDIAN BARRIER WITH A W-BEAM GUARDRAIL MEDIAN TRANSITION. SYSTEMS REQUIRE A RECOVERY AREA. REFER TO STD. DWG. CC SERIES FOR ROADWAY DESIGN GUIDANCE. SYSTEMS HAVE BEEN INCORPORATED AS PART OF THE ANCHORAGE SYSTEM FOR CABLE BARRIER SYSTEMS. REFER TO STANDARD DRAWINGS BA 5 SERIES FOR USE WITH HIGH TENSION CABLE BARRIER SYSTEMS. APPLICATION SHOULD MEET THE REQUIREMENTS OF THE APPLICABLE CC SERIES STANDARD DRAWING.

System Name	Manufacturer	NCHRP Test Level FHWA Approval	MASH Test Level FHWA Approval	Comments
Brakemaster 350	Trinity Highway Products, Inc. Energy Absorption Systems	TL-3 FHWA CC-41 June 19, 1997	None	This is an above ground system. Required a hard surface pad. See Std. Dwg CC 5A for specific grading and installation requirements.
CAT 350	Trinity Highway Products, Inc.	TL-3 FHWA CC-33 series May 1, 1996	None	This is a below ground system. Uses wood post with foundation tubes. See Std. Dwg CC 5B for specific grading and installation requirements.
FLEAT-MT	Road Systems, Inc.	TL-3 FHWA CC-46D Aug 24, 2001	None	This is a below ground system. Uses steel plug welded posts with foundation tubes. See Std. Dwg CC 5C for specific grading and installation requirements.

Type D: SYSTEMS OF THIS TYPE HAVE BEEN CLASSIFIED FHWA AND THE AASHTO ROADSIDE DESIGN GUIDE AS LOW MAINTENANCE AND/OR SELF-RESTORING CRASH CUSHIONS.

PRIMARILY TO PROTECT FIXED HAZARDS, WITH LIMITED RECOVERY AREA, AND HAVE A HIGH PROBABILITY OF IMPACT. HIGHLY RECOMMENDED FOR USE IN GORE AREAS, MAJOR HIGHWAY SPLITS OR IN MEDIAN BARRIER APPLICATION.

THESE SYSTEMS CAN BE USED ON LIMITED BASIS IN A SHOULDER APPLICATION FOR THE PROTECTION OF BARRIER ENDS WHEN THE RECOVERY AREA OR THE APPROACH AREA FOR AN APPROVED END TREATMENT CANNOT BE PROVIDED OR CONDITIONS LISTED BELOW HAVE BEEN MET. DO NOT REDUCE LENGTH OF NEED REQUIREMENTS WHEN THERE IS ROADSIDE RECOVER AREA AVAILABLE. REFER TO STANDARD DRAWINGS CC SERIES.

THE FOLLOWING SHOULD BE ANALYZED PRIOR TO SPECIFYING A SYSTEM OF THIS TYPE:

1. A POSTED OR 85TH PERCENTILE SPEED GREATER THAN 45 MPH
2. DESIGN YEAR AADT GREATER THAN 25,000 AND SYSTEM IS PLACED 12 FEET OR LESS MEASURED FROM EDGE OF TRAVEL LANE TO TRAFFIC SIDE OF SYSTEM.
3. NEW CONSTRUCTION OR ROADWAY MODIFICATIONS, WHERE THE DESIGN SPEED IS GREATER THAN 45 MPH AND A SIMILAR SITE GEOMETRY OR CONDITIONS MAY PRODUCE VEHICLE/CRASH CUSHION IMPACTS AS STATED IN LINE 4.
4. A DOCUMENTED HISTORY OF VEHICLE/CRASH CUSHION IMPACTS, TWO OR MORE IMPACTS OVER A 36 MONTH PERIOD.

DEVIATION FROM THESE CONDITIONS MUST BE APPROVED BY CENTRAL TRAFFIC & SAFETY DESIGNERS WILL DESIGNATE HAZARD WIDTH ON PLAN SET

System Name	Manufacturer	NCHRP Test Level FHWA Approval	MASH Test Level FHWA Approval	Comments
QuadGuard Elite (TL-3)	Trinity	TL-3 FHWA CC-series Sept 14, 2007	None	This system is a low maintenance and has self-restoring qualities after a designed frontal impact. It is included in this type due to the low cost associated with repairs after a design impact. Refer to FHWA approval letter CC-57B. Standard size is 24 inches. Requires additional transition panels to obtain widths greater than 24 inches. Transition will be considered as part of the system and will be included as part of the bid price. The standard width of 24 inches can protect narrower hazards than the 24 inch standard when positioned correctly in front of hazard.
SCI100GM (TL-3)	Work Area Protection	TL-3 FHWA CC- series Sept 12, 2003	None	This system does not have self-restoring capabilities after a designed frontal impact. It is included in this type due to the low cost associated with repairs after a design impact. Refer to FHWA approval letter CC-85B. Standard size is 27 inches. Requires additional transition panels to obtain widths greater than 27 inches. Transition will be considered as part of the system and will be included as part of the bid price. The standard width of 27 inches can protect narrower hazards than the 27 inch standard when positioned correctly in front of hazard..

During December 2014, The Utah Department of Transportation, has retired the “Finding of Public Interest” letter regarding the SCI Smart Cushion impact attenuator.

Type E: Sand Barrel Systems PRIMARILY TO PROTECT HAZARDS A MINIMUM OF 15 FEET FROM TRAVEL LANE WITH AVAILABLE RECOVERY AREA. THIS IS A GATING, NON-REDIRECTIVE CRASH CUSHION SYSTEM. THIS SYSTEM IS A HIGH MAINTENANCE SYSTEM; IT IS RECOMMENDED THIS SYSTEM ONLY BE USED WHEN OTHER SYSTEMS CANNOT BE PLACED, AND ONLY IN AREAS WHERE SNOW CLEARING OPERATIONS WILL NOT CAUSE DAMAGE. APPLICATION SHOULD MEET THE REQUIREMENTS OF THE APPLICABLE CC SERIES STANDARD DRAWING. DO NOT USE THIS SYSTEM TO PROTECT BRIDGE COLUMNS OR PIERS.				
System Name	Manufacturer	NCHRP Test Level FHWA Approval	MASH Test Level FHWA Approval	Comments
Big Sandy	TraFFix Devices Inc.	Design Specific CC-52 series July 10, 1998	None	
Energite III	Trinity Highway Products, Inc. Energy Absorption Systems	Design Specific CC-29 June 28, 1995	None	
Fitch Universal Barrel	Trinity Highway Products, Inc. Energy Absorption Systems	Design Specific CC-28 June 28, 1995	None	

Summary Table of Approved Barrier End Treatments for Permanent Application

CONCRETE BARRIER END TREATMENTS

Type F: SYSTEMS OF THIS TYPE HAVE BEEN CLASSIFIED FHWA AND THE AASHTO ROADSIDE DESIGN GUIDE AS SACRIFICIAL CRASH CUSHIONS. PRIMARILY TO PROTECT CONCRETE BARRIER ENDS AND BRIDGE PARAPETS WITH LIMITED LONGITUDINAL SPACE AND AVAILABLE RECOVERY AREA. SYSTEMS OF THIS TYPE ARE GATING AND REDIRECTIVE SYSTEMS. APPLICATION SHOULD MEET THE REQUIREMENTS OF THE APPLICABLE CC SERIES STANDARD DRAWING.				
System Name	Manufacturer	NCHRP Test Level FHWA Approval	MASH Test Level FHWA Approval	Comments
BEAT-SSCC	Road Systems Inc	TL-3 FHWA CC-69 series Feb 22, 2002	None	System has been designed with a transition incorporated and can be attached directly to a concrete barrier. System can be surface mounted or ground mounted. Meet manufacture's pad requirements for surface mounted systems. Applicable Std. Dwg. CC 7B
Quad Trend 350	Trinity Highway Products, Inc. Energy Absorption Systems	TL-3 FHWA CC-14 series June 18, 1998	None	System requires a concrete pad. System has been designed with a transition incorporated and can be attached directly to a concrete barrier. When connecting to New Jersey Shape concrete barrier, barrier section must be modified to eliminate a snag point at the bottom of the barrier section. When system is attached to a New Jersey shaped bridge parapet one section of modified concrete barrier required. DO NOT modify bridge parapet. Applicable Std. Dwg. CC 7A

W-BEAM BARRIER END TREATMENTS

FHWA and the AASHTO Roadside Design Guide have classified the following as terminals for w-beam guardrail systems. UDOT makes a distinction in the systems by classifying systems as Tangent End Treatments and Flared End Treatments.

Type G: TANGENT END TREATMENTS

PRIMARILY TO PROTECT GUARDRAIL BARRIER ENDS ON TANGENT OR FLARED W-BEAM INSTALLTIONS WITH AVAILABLE RECOVERY AREA. CAN BE USED TO PROTECT CONCRETE BARRIER ENDS AND BRIDGE PARAPETS WHEN A W-BEAM TRANSITION ELEMENT IS USED. SYSTEMS ARE GATING AND REDIREECTIVE. MEET REQUIREMENTS OF STD. DWG. CC 8 SERIES

System Name	Manufacturer	NCHRP Test Level FHWA Approval	MASH Test Level FHWA Approval	Comments
ET PLUS (steel/wood posts)	Trinity Highway Products, Inc.	TL-3 FHWA CC-12G Jan 18, 2000	None	System is energy absorbing terminal. System is 50 feet in length and redirection is achieved beyond post 3. Uses a combination of wood and steel posts, post 1 is a system specific hinge breakaway post, ground driven, posts 2 through 4 are system specific steel SYTP posts inside foundation tubes and posts 5 through 8 are standard CRT breakaway posts, ground driven.
SKT 350 (steel/wood posts)	Road Systems Inc.	TL-3 FHWA CC-40 April 2, 1997	None	System is energy absorbing terminal. System is 50 feet in length and redirection is achieved beyond post 3. Uses a combination of wood and steel posts, posts 1 through 4 are system specific plug welded posts inside foundation tubes and posts 5 through 8 are standard CRT breakaway posts, ground driven.

Type H: FLARED END TREATMENTS

PRIMARILY TO PROTECT GUARDRAIL BARRIER ENDS ON TANGENT OR FLARED W-BEAM INSTALLTIONS WITH AVAILABLE RECOVERY AREA. CAN BE USED TO PROTECT CONCRETE BARRIER ENDS AND BRIDGE PARAPETS WHEN A W-BEAM TRANSITION ELEMENT IS USED. SYSTEMS ARE GATING AND REDIREECTIVE. MEET REQUIREMENTS OF STD. DWG. CC 9 SERIES

System Name	Manufacturer	NCHRP Test Level FHWA Approval	MASH Test Level FHWA Approval	Comments
FLEAT 350 (steel/wood posts)	Road Systems Inc	TL-3 FHWA CC-46 April 2, 1998		System is energy absorbing terminal, and can be installed on a tangent or flared barrier system. System is 37½ feet in length and redirection is achieved beyond post 3. Uses a combination of wood and steel posts, posts 1 and 2 are system specific plug welded posts inside foundation tubes and posts 3 through 7 are standard CRT breakaway posts, ground driven. System was tested with varying offsets ranging from 2 ft. 6 inches to 4 ft. Standard require a full 4 foot offset but it can be reduced to any offset that falls within the range of 2 ft. 6 inches and 4 feet with approval from Engineer.
SRT/ HBA System (steel/wood posts)	Trinity Highway Products, Inc.	TL-3 FHWA CC-46 April 2, 1998		System is a non energy absorbing terminal, designed to allow vehicle to pass through on a head on impact. Can be installed on a tangent or flared barrier system. System is 37½ feet in length and redirection is achieved beyond post 3. Uses a combination of wood and steel posts, post 1 and 2 are system specific hinge breakaway post, ground driven, posts 3 through 7 are standard CRT breakaway posts, ground driven. System was tested with one offset, standards require a full 4 foot offset on all applications.

The following are construction zone systems, supplied by the contractor in most cases. Not all the systems are NCHRP 350 or MASH approved, use permitted until service life has expired.

Construction Zone Crash Cushions and Temporary End Treatments
ALL systems in this category are contractor supplied.

System Name	Manufacturer	NCHRP or MASH Test Level	Comments
NEAT®	Energy Absorption System	TL-2, ≤ 45 MPH	This is a gating non-redirective system and a recovery area meeting length of need requirements beginning at the point the system attaches to the concrete barrier. Recovery area will not have a slope of greater than 4:1.
QuadGuard CZ	Energy Absorption System	TL-2 ≤ 45 MPH - 3 bay TL-3 > 45 MPH - 6 bay	Mounting to asphalt surfaces permitted in work zone, meet manufactures requirements.
QUEST	Energy Absorption System	TL-3 > 45 MPH	Mounting to asphalt surfaces permitted in work zone, meet manufactures requirements.
REACT 350	Energy Absorption System	< 45 MPH 4 cylinders TL-2, ≥ 45 MPH ≤ 55 MPH 6 cylinders TL-3, > 55 MPH 9 cylinders	Mounting to asphalt surfaces permitted in work zone, meet manufactures requirements.
SCI 70 SCI 100	Work Area Protection	TL-2 ≤ 45 MPH TL-3 > 45 MPH	Mounting to asphalt surfaces permitted in work zone, meet manufactures requirements.
TAU-II	Barrier Systems Inc.	TL-2, ≤ 45 MPH - 4 bay TL-3 > 45 MPH - 8 bay	Mounting to asphalt surfaces permitted in work zone, meet manufactures requirements.
Short- TRACC TRACC	Trinity Highway Products	TL-2 ≤ 45 MPH TL-3 > 45 MPH	Mounting to asphalt surfaces permitted in work zone, meet manufactures requirements.
Sand Barrels Arrays "Big Sandy" Energite III Universal Barrel	TrafFix Devices Inc. Energy Absorption Energy Absorption	TL-2, TL-3	When using this system meet all installation requirements as per a permanent application. See Type E permanent crash cushion
GREAT CZ® Energy Absorption System This system is not an NCHRP 350 approved system. Use permitted until service life has expired.		Speed ≤ 45 MPH, 3 bays Speed > 45 MPH, 6 bays	Mounting to asphalt surfaces permitted in work zone, meet manufactures requirements.
WATER FILLED END TREATMENTS		Conditions for Use: 1. Use an environmentally friendly antifreeze solution when protection from freezing is required. 2. Pump fill liquid in and out of end treatment sections 3. DO NOT DUMP ANY FILL LIQUID onto roadway or in the right of ways.	
ABSORB 350	Barrier Systems Inc.	TL-2 ≤ 45 MPH, 5 std. sections TL-3 > 45 MPH, 9 std. sections	This is a gating non-redirective system and a recovery area meeting length of need requirements beginning at the point the system attaches to the concrete barrier. Recovery area will not have a slope of greater than 4:1. Recover area will be free of any obstructions. Steel transition, system specific, to concrete barrier required.. Install according to manufacturer's requirements.
AZT-350	Trinity Highway Products, Inc. Energy Absorption System	TL-2 ≤ 45 MPH, steel sheet metal nose and 2 std. sections TL-3 > 45 MPH, steel sheet metal nose and 4 std. sections	This is a gating non-redirective system and a recovery area meeting length of need requirements beginning at the point the system attaches to the concrete barrier. Recovery area will not have a slope of greater than 4:1. Recover area will be free of any obstructions. Steel transition, system specific, to concrete barrier required. Install according to manufacturer's requirements.
Triton CET System	Trinity Highway Products, Inc. Energy Absorption System	TL-2 ≤ 45 MPH, 6 std. sections TL-3 > 45 MPH, 6 std. sections set on specified pedestals.	This is a gating non-redirective system and a recovery area meeting length of need requirements beginning at the point the system attaches to the concrete barrier. Recovery area will not have a slope greater than 4:1. Recover area will be free of any obstructions. Steel transition, system specific, to concrete barrier required. Install according to manufacturer's requirements.
SLED Sentry Longitudinal Energy Dissipater	Traffix Devices Inc.	TL-2 ≤ 45 MPH, sled with 3 std sections. TL-3 > 45 MPH, sled with 4 std sections.	This is a gating non-redirective system and a recovery area meeting length of need requirements beginning at the point the system attaches to the concrete barrier. Recovery area will not have a slope greater than 4:1. Recover area will be free of any obstructions. Steel transition, system specific, to concrete barrier required. Install according to manufacturer's requirements.

3-4-2013 Correct recovery area requirements all water filled end treatments

TYPE A (4 approved systems)

SYSTEMS OF THIS TYPE HAVE BEEN CLASSIFIED BY FHWA AND THE AASHTO ROADSIDE DESIGN GUIDE AS REUSABLE CRASH CUSHIONS.

PRIMARILY TO PROTECT FIXED HAZARDS, GREATER THAN 36 INCHES WIDE, WITH LIMITED RECOVERY AREA OR POINT HAZARDS. THESE SYSTEMS ARE NON-GATING. SYSTEMS OF THIS TYPE MAY BE USED AS STAND ALONE SYSTEMS ON SHOULDER APPLICATIONS FOR THE PROTECTION OF POINT HAZARDS (IE., SIGN FOUNDATIONS) WHEN A COST ANALYSIS DETERMINES IT MORE COST EFFECTIVE TO INSTALL THIS TYPE OF SYSTEM THAN TO INSTALL ADDITIONAL BARRIER. USE IN GORE AREAS AND MEDIAN APPLICATION TO PROTECT ENDS OF MEDIAN BARRIER WHEN BIDIRECTIONAL TRAFFIC IS PRESENT AND THE SITE GEOMETRY IS SUCH THAT FREQUENT IMPACTS ARE NOT ANTICIPATED. THESE SYSTEMS CAN BE USED ON LIMITED BASIS IN A SHOULDER APPLICATION FOR THE PROTECTION OF BARRIER ENDS WHEN THE APPROACH AREA AND RECOVERY AREA FOR AN APPROVED END TREATMENT CANNOT BE PROVIDED. DO NOT REDUCE LENGTH OF NEED REQUIREMENTS WHEN THERE IS ROADSIDE RECOVER AREA AVAILABLE. APPLICATION SHOULD MEET THE REQUIREMENTS OF THE APPLICABLE CC SERIES STANDARD DRAWING..

DESIGNERS WILL DESIGNATE HAZARD WIDTH ON PLAN SET.

Name: QuadGuard II™ Wide, from Energy Absorption Systems

http://energyabsorption.com/products/products_quadguard2_crash.asp

QuadGuard™ M10 Wide, from Energy Absorption Systems

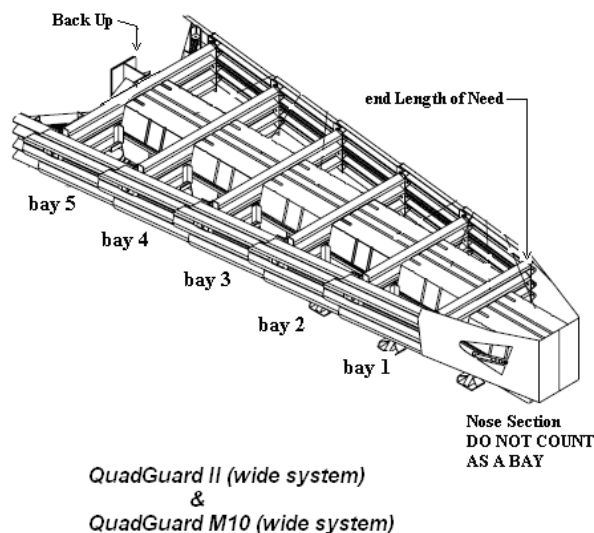
http://energyabsorption.com/products/products_quadguardM10.asp

Local supplier: Interwest Safety Supply, Inc. Provo, Utah phone: (801) 375-6321

<http://www.interwestsafety.com/>

Sales Consultants: Dave Kranz e-mail: dkrantz@iwsafety.com

3-2013 Revised sale consultant information



Width:

2 standard widths: 69 inches and 90 inches. Manufacturer will provide design for on-standard systems.

Site visit to existing hazard recommended insuring proper design is supplied.

Designers will designate hazard width on plan set.

Length and MASH Test Level and NCHRP 350 Test Level

Length of system can vary based on speed requirements.

System Length	MASH Test Level
QuadGuard™ M10 Wide	
3 bay, length 13' - 0"	TL-2, ≤ 45 MPH
4 bay, length 16' - 0"	TL-2+, ≤ 50 MPH
5 bay, length 19' - 0"	TL-2+, 55 MPH
6 bay, length 22' - 0"	TL-3, ≥ 55 MPH

System Length	NCHRP Test Level
QuadGuard II™ Wide	
1 bay, length 6' - 11"	TL-1, ≤ 40 MPH
2 bay, length 9' - 11"	TL-2, ≤ 45 MPH
3 bay, length 12' - 11"	TL-2+, 50 MPH
4 bay, length 16' - 0"	TL-2+, 55 MPH
5 bay, length 19' - 0"	TL-3, ≥ 55 MPH

Length determined using Tension Strut Backup, will vary with other approved backup systems.

The nose section of these systems are not counted as a bay, see diagram above.

*** Note:** *The manufacturer's design manual for this system indicates more bays are required for higher levels of speed. However, these systems exceed the requirements set by FHWA and are not required for use. Designers will not specify higher speed systems for installation. Suppliers will bid only systems to the capacity as designated in these Guidelines.*

Length of Need: from rear of nose section

Characteristics

Re-directive, bi-directional, unidirectional, non-gating, non-pocketing.

System is equipped with two types of crushable, energy absorbing cartridges that absorb energy from an impacting vehicle. The fender panels redirect an impacting vehicle.

Application

For fixed objects near the traveled lane(s), with a width ranging from 60 inches to a maximum width of 90 inches, where there is less than 100 feet of clear area in front of hazard, and the recovery area on the backside of the system is less than 75 feet x 20 feet.

This system can be used to protect concrete barrier, hazards in gore areas, lighting and sign structures, bridge parapets, as a stand-alone system when the required Length of Need and recover area cannot be achieved.

This system should be used in areas where minimal impacts are anticipated (one impact every three or more years).

Requirements

The area in front of the system will have a slope of 10:1 or less and be free of any obstacles, except flexible delineators as specified in Standard Drawings, for a minimum of 50 feet. The slope to the sides of the system, from any travel lane, will be no greater than 10:1 and be free of any obstacles, refer to Standard Drawing CC 4 Series. When system is installed in a bi-directional application a transition will be installed to accommodate a backside impact as per Standard Specification 02843. Transition elements are required for use with single and double-faced guardrail. **Theses System will be installed on a concrete pad to meet manufacture's requirements for permanent installation. Designer does not need to specify concrete pad requirements.**

These systems use two types of crushable, energy absorbing cartridges, QuadGuard II Type I or Type II, QuadGuard M10 type M-1 or Type M-2. It is critical the proper cartridge is in the proper bay. The nose compartment uses a Type I cartridge in all applications. See manufacturer's specifications for pad, backup and transition requirements.

The manufacturer, supplier, or installer of the system will provide the appropriate directional object panel and marker post, Standard Drawing CC 1.

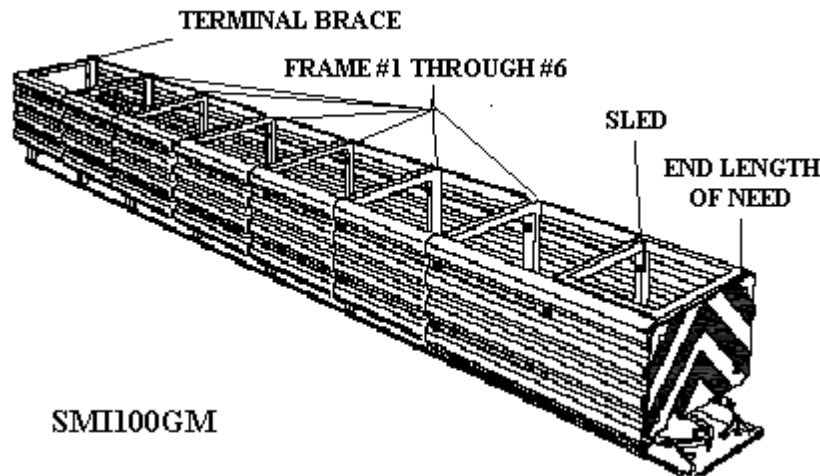
Meet drainage requires as per the applicable Standard Drawing CC 4 Series.

Type A (continued)

Name: Smart Cushions Innovations (SCI), from Work Area Protection Corporation
<http://www.workareaprotection.com/attenuator.htm>

Local supplier: Intermountain Traffic Safety, Inc. Salt Lake City, Utah phone: (801) 972-6515
Sales Consultant: Mike Knaras email: mike@it-safety.com

SCI Products Inc., St. Charles, IL
Roger Alfrey, Western Regional Manager,
phone: 801-330-4324, or 800-327-4417 email: ralfrey@sciproductionsinc.com



Length and NCHRP Test Level

System Length *	NCHRP Test Level
SCI 70, standard length 13' 6"	TL-2 ≤ 45 MPH
SCI 100, standard length 21' 6"	TL-3 > 45 MPH

*** Length will increase with width. Consult supplier for design requirements.**

Width

Standard width 27"

In order for this system to be used in an application greater than 27 inches the system uses additional transition panels and spanner posts. These additional panels and post will add additional length to the system. These additional panels and post will be supplied as part of the system and will not be paid separately.

**Site visit to existing hazard recommended insuring proper design is supplied.
Designers will designate hazard width on plan set.**

Length of Need

From the front of system

Characteristics

Re-directive, bi-directional, unidirectional, non-gating, non-pocketing.

System uses the combination of a cable braking action and the compression of a shock-absorbing cylinder. The fender panels redirect an impacting vehicle.

Application

For fixed objects near the traveled lane(s), where there is less than 100 feet of clear area in front of hazard, and the recovery area on the backside of the system is less than 75 feet x 20 feet.

This system can be used to protect concrete barrier, hazards in gore areas, lighting and sign structures, bridge parapets, as a stand-alone system when the required Length of Need and recover area cannot be achieved.

Transition elements are required for use with single and double-faced guardrail and when placed where there is a potential for a backside impact.

Requirements

The area in front of the system will have a slope of 10:1 or flatter and be free of any obstacles except flexible delineators as specified in Standard Drawings, for a minimum of 50 feet. The slope to the sides of the system, from any travel lane, will be no greater than 10:1 and be free of any obstacles Refer to Standard Drawings CC 4 series. When system is installed in a bi-directional application a transition will be installed to accommodate a backside impact as per Standard Specification 02843. Transition elements are required for use with single and double-faced guardrail. **Theses System will be installed on a concrete pad to meet manufacture's requirements for permanent installation. Designer does not need to specify concrete pad requirements.**

See manufacturer's specifications for pad, backup and transition requirements. The manufacturer, supplier, or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD. DWG CC 1. The object marker plate and marker post will not be a separate pay item and will be installed in all application.

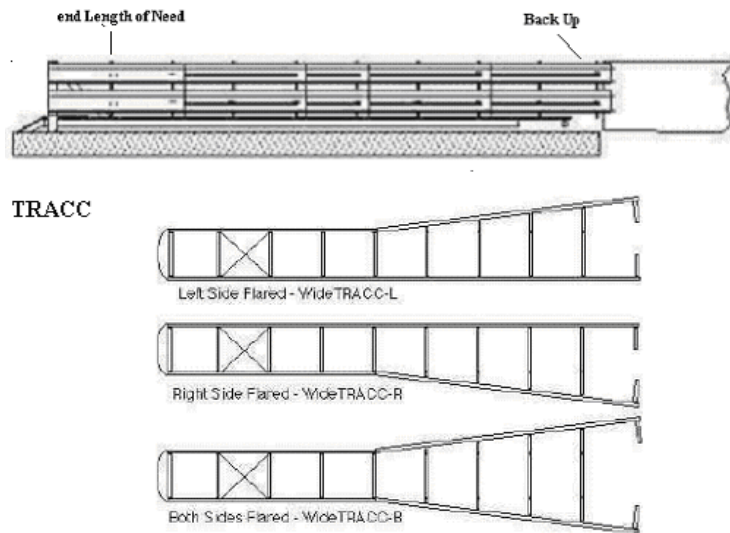
See STD DWG CC 2, Plan A2 or STD DWG CC 3 Guideline B, where drainage requirements are needed

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Type A (continued)

Name: Wide TRACC™ system, from Trinity Highway Products, Inc.
<http://www.highwayguardrail.com/products/tracc.html>

Local supplier: Trinity Highway Products, Centerville, Utah phone: (801) 292-4461
Sales Consultant : Jonathan Nordquist, email jonathan.nordquist@trin.net



Basic WideTRACC configurations.

Length and NCHRP Test Level

System Length *	NCHRP Test Level
ShorTRACC standard length 14'	TL-2 ≤ 45 MPH
TRACC, standard length 21'	TL-3 > 45 MPH

* Length will increase with width. Consult supplier for design requirements.

** Note: The manufacturer's design manual for this system indicates more bays are required for higher levels of speed. However, these systems exceed the requirements set by FHWA and are not required for use. Designers will not specify higher speed systems for installation. Suppliers will bid only systems to the capacity as designated in these Guidelines.*

Width

Custom designed, width of hazard required for proper design. When design of system consists of a right or left flare, the design will be such as to place the TRACC as far from the closest approach lane.

Site visit, to existing hazard recommended, to insure the proper design is supplied.

Designers will designate hazard width on plan set.

Length of Need

From second frame element from front of system

Characteristics

Re-directive, bi-directional, unidirectional, non-gating, non-pocketing.

System uses cutter bolts, at the base of the system, to shear steel plates, which absorbs energy from an impacting vehicle. The fender panels redirect an impacting vehicle.

Application

For fixed objects near the traveled lane(s), with a width ranging from 37 inches to required width of hazard, and where there is less than 100 feet of clear area in front of hazard, and the recovery area on the backside of the system is less than 75 feet x 20 feet.

This system can be used to protect concrete barrier, hazards in gore areas, lighting and sign structures, bridge parapets, as a stand-alone system. Transition elements are required for use with single and double-faced guardrail and when placed where there is a potential for a backside impact. This system should be used in areas where minimal impacts are anticipated (one impact every three or more years).

Requirements

The area in front of the system will have a slope of 10:1 or less and be free of any obstacles for a minimum of 50 feet. The slope to the sides of the system, from any travel lane, will be no greater than 10:1 and be free of any obstacles Refer to UDOT STD DWG CC 4. When system is installed in a bi-directional application a transition will be installed to accommodate a backside impact as per Standard Specification 02843. Transition elements are required for use with single and double-faced guardrail. **Theses System will be installed on a concrete pad to meet manufacture's requirements for permanent installation. Designer does not need to specify concrete pad requirements.**

See manufacturer's specifications for pad, backup and transition requirements. This system uses rip plates of varying gage, it is critical the proper rip plate is installed in the correct position. The manufacturer, supplier, or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD. DWG CC 1. The object marker plate and marker post will not be a separate pay item and must be installed in all application.

See STD DWG CC 2, Plan A2 or STD DWG CC 3 Guideline B, where drainage requirements are needed

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Type A (continued)

Name: Wide Universal TAU II® system, from Barrier System, Inc.

<http://www.barriersystemsinc.com/>

Local supplier: Safety Supply & Sign Co. Inc. Salt Lake City, Utah phone: (801) 973-2266

Sales Consultant: Carvel Anderson email: carvel@safetysupplyandsign.com

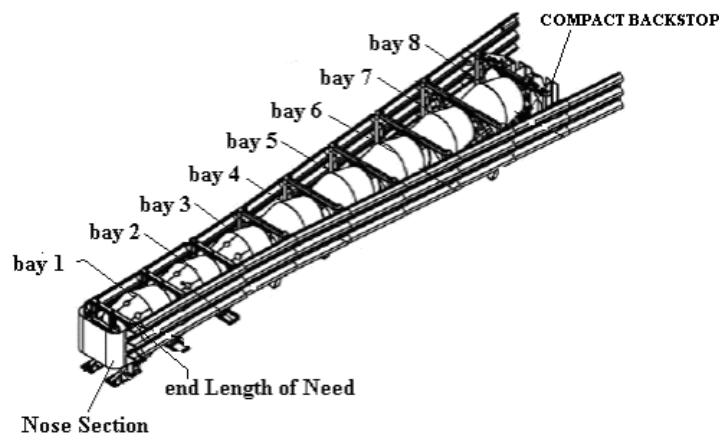
Local supplier: Utah Barricade, Salt Lake City, Utah phone: (801) 973-9800

Sales Consultant: Doug Coleman email: doug@utahbarricade.com

Barrier Systems, Vacaville CA

Tony Smiley, Western Regional Manager

Phone: (402) 210-4593, 210-4531 email: TonySmiley@lindsay.com



UNIVERSAL TAU II Wide
TL-3 System shown

Length and NCHRP Test Level

System Length *	NCHRP Test Level
2 to 3 bay, based on width requirement	TL-1, ≤ 40 MPH
3 to 5 bay, based on width requirement	TL-2, ≤ 45 MPH
4 to 5 bay, based on width requirement	TL-2+, 50 MPH
5 to 7 bay, based on width requirement	TL-2+, 55 MPH
7 to 8 bay, based on width requirement	TL-3, ≥ 60 mph

** Note: The manufacturer's design manual for this system indicates more bays are required for higher levels of speed. However, these systems exceed the requirements set by FHWA and are not required for use. Designers will not specify higher speed systems for installation. Suppliers will bid only systems to the capacity as designated in these Guidelines.*

Width

Systems are available in width of 42 inches to 102 inches in 6-inch increments.

Site visit to existing hazard recommended to insure proper design is supplied.

Designers will designate hazard width on plan set.

Length of Need

From the beginning of system

Characteristics

Re-directive, bi-directional, unidirectional, non-gating, non-pocketing.

System is equipped with two types of crushable, energy absorbing cartridges that absorb energy from an impacting vehicle. The fender panels redirect an impacting vehicle.

Application

For fixed objects near the traveled lane(s), with a width ranging from 37 inches to required width of hazard, and where there is less than 100 feet of clear area in front of hazard, and the recovery area on the backside of the system is less than 75 feet x 20 feet.

This system can be used to protect concrete barrier, hazards in gore areas, lighting and sign structures, bridge parapets, as a stand-alone system.

This system should be used in areas where minimal impacts are anticipated (one impact every three or more years).

Requirements

The area in front of the system will have a slope of 10:1 or less and be free of any obstacles for a minimum of 50 feet. The slope to the sides of the system, from any travel lane, will be no greater than 10:1 and be free of any obstacles, refer to UDOT STD DWG CC 4. When system is installed in a bi-directional application a transition will be installed to accommodate a backside impact as per Standard Specification 02843. Transition elements are required for use with single and double-faced guardrail. **Theses System will be installed on a concrete pad to meet manufacture's requirements for permanent installation. Designer does not need to specify concrete pad requirements.**

There are specific backstop requirements for this system, consult manufacturer's requirements to insure proper backup is installed for the required application.

This system uses two types of crushable, energy absorbing cartridges. It is critical the proper cartridge is in the proper bay. The 1st bay can use either Type A or Type B cartridge and is based on the design application. It is critical that the right cartridge is placed in the appropriate location.

The manufacturer, supplier, or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD. DWG CC 1. The object marker plate and marker post will not be a separate pay item and must be installed in all application.

See STD DWG CC 2, Plan A2 or STD DWG CC 3 Guideline B, where drainage requirements are needed.

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TYPE B (5 approved systems)

SYSTEMS OF THIS TYPE HAVE BEEN CLASSIFIED BY FHWA AND THE AASHTO ROADSIDE DESIGN GUIDE AS REUSABLE CRASH CUSHIONS.

PRIMARILY TO PROTECT FIXED HAZARDS, LESS THAN OR EQUAL TO 36 INCHES WIDE, WITH LIMITED RECOVERY AREA OR POINT HAZARDS. THESE SYSTEMS ARE NON-GATING. SYSTEMS OF THIS TYPE MAY BE USED AS STAND ALONE SYSTEMS ON SHOULDER APPLICATIONS FOR THE PROTECTION OF POINT HAZARDS (IE: SIGN FOUNDATIONS) WHEN A COST ANALYSIS DETERMINES IT MORE COST EFFECTIVE TO INSTALL THIS TYPE OF SYSTEM THAN TO INSTALL ADDITIONAL BARRIER. USE IN GORE AREAS AND MEDIAN APPLICATION TO PROTECT ENDS OF MEDIAN BARRIER WHEN BIDIRECTIONAL TRAFFIC IS PRESENT AND THE SITE GEOMETRY IS SUCH THAT FREQUENT IMPACTS ARE NOT ANTICIPATED. THESE SYSTEMS CAN BE USED ON LIMITED BASIS IN A SHOULDER APPLICATION FOR THE PROTECTION OF BARRIER ENDS WHEN THE APPROACH AREA AND RECOVERY AREA FOR AN APPROVED END TREATMENT CANNOT BE PROVIDED. DO NOT REDUCE LENGTH OF NEED REQUIREMENTS WHEN THERE IS ROADSIDE RECOVER AREA AVAILABLE. APPLICATION SHOULD MEET THE REQUIREMENTS OF THE APPLICABLE CC SERIES STANDARD DRAWING.

DESIGNERS WILL DESIGNATE HAZARD WIDTH ON PLAN SET

Name: QuadGuard II™, from Energy Absorption Systems

http://energyabsorption.com/products/products_quadguard2_crash.asp

QuadGuard™ M10, from Energy Absorption Systems

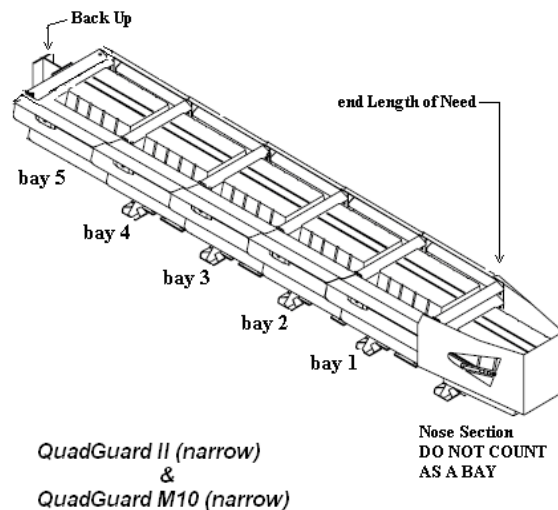
http://energyabsorption.com/products/products_quadguardM10.asp

Local supplier: Interwest Safety Supply, Inc. Provo, Utah phone: (801) 375-6321

<http://www.interwestsafety.com/>

Sales Consultants: Dave Kranz e-mail: dkrantz@iwsafety.com

3-4-2013 Revised sale consultant information



Width

3 standard widths: 24 inches, 30 inches and 36 inches. Manufacturer will provide design for non-standard systems.

Site visit to existing hazard recommended insuring proper design is supplied.

Designers will designate hazard width on plan set.

Length and MASH Test Level and NCHRP 350 Test Level

Length of system can vary based on speed requirements.

System Length*	MASH Test Level
QuadGuard™ M10 Wide	
3 bay, length 13' - 0"	TL-2, ≤ 45 MPH
4 bay, length 16' - 0"	TL-2+, ≤ 50 MPH
5 bay, length 19' - 0"	TL-2+, 55 MPH
6 bay, length 22' - 0"	TL-3, ≥ 55 MPH

System Length*	NCHRP Test Level
QuadGuard II™ Wide	
1 bay, length 6' - 11"	TL-1, ≤ 40 MPH
2 bay, length 9' - 11"	TL-2, ≤ 45 MPH
3 bay, length 12' - 11"	TL-2+, 50 MPH
4 bay, length 16' - 0"	TL-2+, 55 MPH
5 bay, length 19' - 0"	TL-3, ≥ 55 MPH

Length determined using Tension Strut Backup, will vary with other approved backup systems.
The nose section of these systems are not counted as a bay, see diagram above.

*** Note:** *The manufacturer's design manual for this system indicates more bays are required for higher levels of speed. However, these systems exceed the requirements set by FHWA and are not required for use. Designers will not specify higher speed systems for installation. Suppliers will bid only systems to the capacity as designated in these Guidelines.*

Length of Need:

Rear of the nose section

Characteristics

Re-directive, bi-directional, unidirectional, non-gating, non-pocketing.

System is equipped with two types of crushable, energy absorbing cartridges that absorb energy from an impacting vehicle. The fender panels redirect an impacting vehicle.

This system may be retrofitted to meet the requirements of the Type D, QuadGuard Elite System requirements, when repair history indicates a benefit would be realized.

Application

For fixed objects near the traveled lane(s), with a width ranging from 24 inches to a maximum width of 36 inches, where there is less than 100 feet of clear area in front of hazard, and the recovery area on the backside of the system is less than 75 feet x 20 feet.

This system can be used to protect concrete barrier, hazards in gore areas, lighting and sign structures, bridge parapets, and as a stand-alone system.

This system should be used in areas where minimal impacts are anticipated (one impact every three or more years).

Requirements

The area in front of the system will have a slope of 10:1 or less and be free of any obstacles for a minimum of 50 feet. The slope to the sides of the system, from any travel lane, will be no greater than 10:1 and be free of any obstacles, refer to UDOT STD DWG CC 4. When system is installed in a bi-directional application a transition will be installed to accommodate a backside impact as per Standard Specification 02843. Transition elements are required for use with single and double-faced guardrail. **Theses System will be installed on a concrete pad to meet manufacture's requirements for permanent installation. Designer does not need to specify concrete pad requirements.**

This system uses two types of crushable, energy absorbing cartridges. It is critical the proper cartridge is in the proper bay. The nose compartment uses a Type I cartridge in all applications. See manufacturer's specifications for pad, backup and transition requirements.

The manufacturer, supplier, or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD. DWG CC 1. The object marker plate and marker post will not be a separate pay item and must be installed in all application.

See STD DWG CC 2, Plan A2 or STD DWG CC 3 Guideline B, where drainage requirements are needed.

Type B (continued)

Name: QUEST™, from Energy Absorption Systems, Inc.

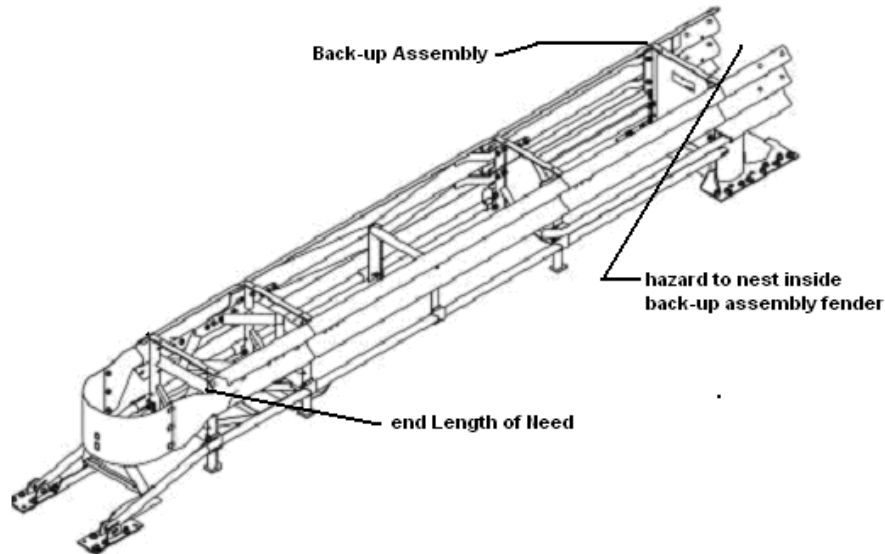
http://energyabsorption.com/products/products_questimpact.asp

Local supplier: Interwest Safety Supply, Inc. Provo, Utah phone: (801) 375-6321

<http://www.interwestsafety.com/>

Sales Consultants: Dave Kranz e-mail: dkrantz@iwsafety.com

3-2013 Revised sale consultant information



Length

System Length	NCHRP Test Level
Standard: 22'2"	TL-3, ≥ 55 MPH

Width

Standard: 24"

Length of Need

From front of system

Characteristics

Re-directive, bi-directional, unidirectional, non-gating, non-pocketing.

During head-on impacts, the system telescopes rearward and energy is absorbed through momentum transfer, friction and deformation. When impacted from the side, the system restrains lateral movement by dynamic tension developed between end restraints and safely redirects the impacting vehicle.

Application

For fixed objects near the traveled lane(s), with a hazard width of 24 inches or less, and where there is less than 100 feet of clear area in front of hazard, and the recovery area on the backside of the system is less than 75 feet x 20 feet.

This system can be used to protect concrete barrier, hazards in gore areas, lighting and sign structures, bridge parapets, as a stand-alone system. System is designed to have the hazard nested inside back-up fender panels. Transition elements are required for use with single and double-faced guardrail and when placed where there is a potential for a backside impact. This system should be used in areas where minimal impacts are anticipated (one impact every three or more years).

Requirements

The area in front of the system will have a slope of 10:1 or less and be free of any obstacles for a minimum of 50 feet. The slope to the sides of the system, from any travel lane, will be no greater than 10:1 and be free of any obstacles Refer to UDOT STD DWG CC 4. When system is installed in a bi-directional application a transition will be installed to accommodate a backside impact as per Standard Specification 02843. Transition elements are required for use with single and double-faced guardrail. **Theses System will be installed on a concrete pad to meet manufacture's requirements for permanent installation. Designer does not need to specify concrete pad requirements.**

See manufacturer's specifications for pad, backup and transition requirements. The manufacturer, supplier, or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD. DWG CC 1. The object marker plate and marker post will not be a separate pay item and must be installed in all application.

See STD DWG CC 2, Plan A2 or STD DWG CC 3 Guideline B, where drainage requirements are needed

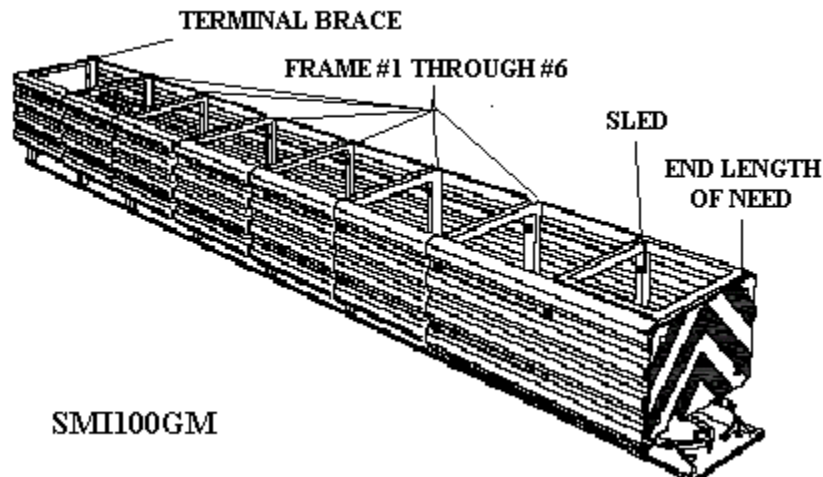
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Type B (continued)

Name: Smart Cushions Innovations (SCI), from Work Area Protection Corporation
<http://www.workareaprotection.com/attenuator.htm>

Local supplier: Intermountain Traffic Safety, Inc. Salt Lake City, Utah phone: (801) 972-6515
Sales Consultant: Mike Knaras email: mike@it-safety.com

SCI Products Inc., St. Charles, IL
Roger Alfrey, Western Regional Manager,
phone: 801-330-4324, or 800-327-4417 email: ralfrey@sciproductionsinc.com



Length and NCHRP Test Level

System Length *	NCHRP Test Level
SCI 70, standard length 13' 6"	TL-2 ≤ 45 MPH
SCI 100, standard length 21' 6"	TL-3 > 45 MPH

* Length will increase with width. Consult supplier for design requirements.

Width

Standard width 27"

Additional width is developed using transition panels. Standard transition panel for 30" and 36" are available. Transition panels and spanner bars are considered part of the system and will not be paid for separately.

Width

Standard width 27"

In order for this system to be used in an application greater than 27 inches the systems uses additional transition panels and spanner posts. These additional panels and post will add additional length to the system. These additional panels and post will be supplied as part of the system and will not be paid separately.

Site visit to existing hazard recommended insuring proper design is supplied.

Length of Need

From the front of system

Characteristics

Re-directive, bi-directional, unidirectional, non-gating, non-pocketing.

System uses the combination of a cable braking action and the compression of a shock-absorbing cylinder. The fender panels redirect an impacting vehicle.

Application

For fixed objects near the traveled lane(s), with a width ranging up to 30 inches, and where there is less than 100 feet of clear area in front of hazard, and the recovery area on the backside of the system is less than 75 feet x 20 feet.

This system can be used to protect concrete barrier, hazards in gore areas, lighting and sign structures, bridge parapets, as a stand-alone system. Transition elements are required for use with single and double-faced guardrail and when placed where there is a potential for a backside impact. This system should be used in areas where minimal impacts are anticipated (one impact every three or more years).

Requirements

The area in front of the system will have a slope of 10:1 or less and be free of any obstacles for a minimum of 50 feet. The slope to the sides of the system, from any travel lane, will be no greater than 10:1 and be free of any obstacles Refer to UDOT STD DWG CC series. When system is installed in a bi-directional application a transition will be installed to accommodate a backside impact as per Standard Specification 02843. Transition elements are required for use with single and double-faced guardrail. **Theses System will be installed on a concrete pad to meet manufacture's requirements for permanent installation. Designer does not need to specify concrete pad requirements.**

See manufacturer's specifications for pad, backup and transition requirements. The manufacturer, supplier, or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD. DWG CC 1. The object marker plate and marker post will not be a separate pay item and will be installed in all application.

See STD DWG CC 2, Plan A2 or STD DWG CC 3 Guideline B, where drainage requirements are needed

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Type B (continued)

Name: Universal TAU II® system, from Barrier System, Inc.

<http://www.barriersystemsinc.com/>

Local supplier: Safety Supply & Sign Co. Inc. Salt Lake City, Utah phone: (801) 973-2266

Sales Consultant: Carvel Anderson email: carvel@safetysupplyandsign.com

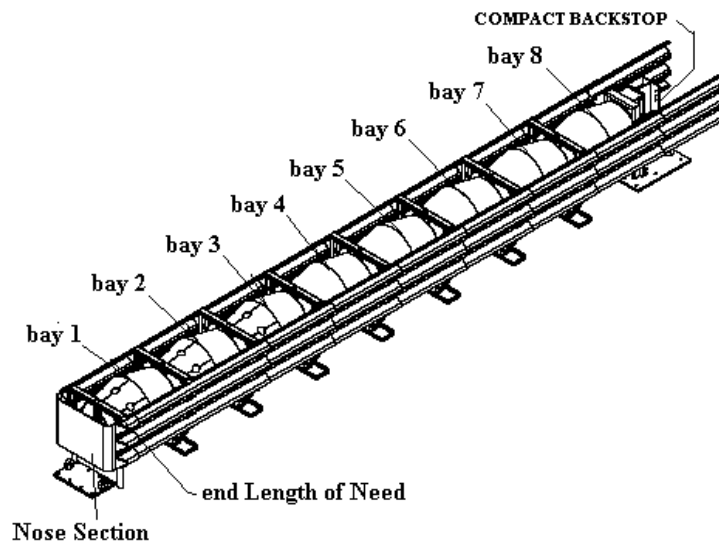
Local supplier: Utah Barricade, Salt Lake City, Utah phone: (801) 973-9800

Sales Consultant: Doug Coleman email: doug@utahbarricade.com

Barrier Systems, Vacaville CA

Tony Smiley, Western Regional Manager

Phone: (402) 210-4593, 210-4531 email: TonySmiley@lindsay.com



UNIVERSAL TAU II
TL-3 SYSTEM shown

Length and NCHRP Test Level

System Length *	NCHRP Test Level
2 to 3 bay, varies based on backup used	TL-1, ≤ 40 MPH
4 bay, varies based on backup used	TL-2, ≤ 45 MPH
5 bay, varies based on backup used	TL-2+, 50 MPH
7 bay, varies based on backup used	TL-2+, 55 MPH
8 bay, varies based on backup used	TL-3, ≥ 60 mph

** Note: The manufacturer's design manual for this system indicates more bays are required for higher levels of speed. However, these systems exceed the requirements set by FHWA and are not required for use. Designers will not specify higher speed systems for installation. Suppliers will bid only systems to the capacity as designated in these Guidelines.*

Width

Systems are available in standard widths of 24 inches, 30 inches and 36 inches.

Site visit to existing hazard recommended to insure proper design is supplied.

Designers will designate hazard width on plan set.

Length of Need

From the beginning of system

Characteristics

Re-directive, bi-directional, unidirectional, non-gating, non-pocketing.

System is equipped with two types of crushable, energy absorbing cartridges that absorb energy from an impacting vehicle. The fender panels redirect an impacting vehicle.

Application

For fixed objects near the traveled lane(s), with a hazard width of 36 inches or less, and where there is less than 100 feet of clear area in front of hazard, and the recovery area on the backside of the system is less than 75 feet x 20 feet.

This system can be used to protect concrete barrier, hazards in gore areas, lighting and sign structures, bridge parapets, and as a stand-alone system.

This system should be used in areas where minimal impacts are anticipated (one impact every three or more years).

Requirements

The area in front of the system will have a slope of 10:1 or less and be free of any obstacles for a minimum of 50 feet. The slope to the sides of the system, from any travel lane, will be no greater than 10:1 and be free of any obstacles, refer to UDOT STD DWG CC 4. When system is installed in a bi-directional application a transition will be installed to accommodate a backside impact as per Standard Specification 02843. Transition elements are required for use with single and double-faced guardrail. **Theses System will be installed on a concrete pad to meet manufacture's requirements for permanent installation. Designer does not need to specify concrete pad requirements.**

There are specific backstop requirements for this system, consult manufacturer's requirements to insure proper backup is installed for the required application.

This system uses two types of crushable, energy absorbing cartridges. It is critical the proper cartridge is in the proper bay. The 1st bay uses Type A cartridge in all application except for speeds 30 MPH and lower. It is critical that the right cartridge is placed in the appropriate location.

The manufacturer, supplier, or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD. DWG CC 1. The object marker plate and marker post will not be a separate pay item and must be installed in all application.

See STD DWG CC 2, Plan A2 or STD DWG CC 3 Guideline B, where drainage requirements are needed.

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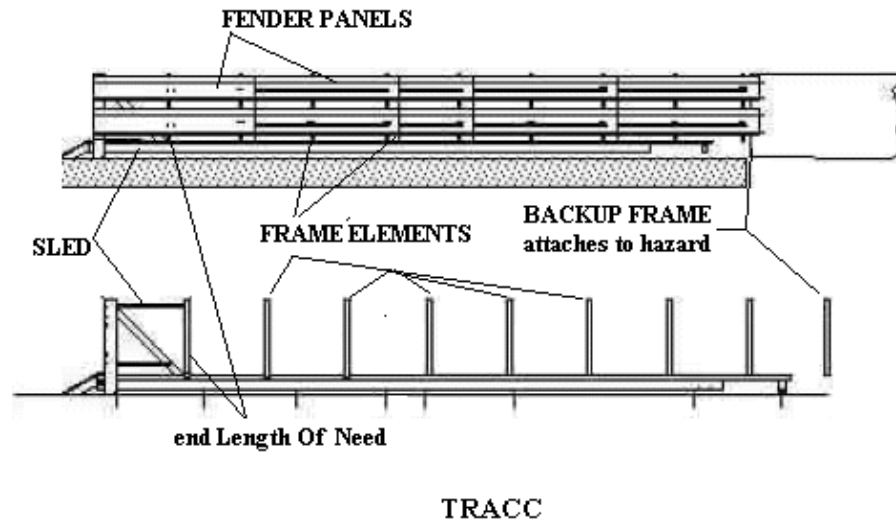
Type B (continued)

Name: TRACC™ system, from Trinity Highway Products, Inc.

<http://www.highwayguardrail.com/products/tracc.html>

Local supplier: Trinity Highway Products, Centerville, Utah phone: (801) 292-4461

Sales Consultant : Jonathan Nordquist, email jonathan.nordquist@trin.net



Length and NCHRP Test Level

System Length *	NCHRP Test Level
Short TRACC 14 '	TL-2, ≤ 45 MPH
TRACC 21'	TL-3, > 45 MPH

** Note: The manufacturer's design manual for this system indicates more bays are required for higher levels of speed. However, these systems exceed the requirements set by FHWA and are not required for use. Designers will not specify higher speed systems for installation.*

Suppliers will bid only systems to the capacity as designated in these Guidelines.

Width

2 standard width, 24 and 30 inches

Length of Need

From second frame element from front of system

Characteristics

Re-directive, bi-directional, unidirectional, non-gating, non-pocketing.

System uses cutter bolts, at the base of the system, to shear steel plates, which absorbs energy from an impacting vehicle. The fender panels redirect an impacting vehicle

Application

For fixed objects near the traveled lane(s), with a hazard width of 30 inches or less required, and where there is less than 100 feet of clear area in front of hazard, and the recovery area on the backside of the system is less than 75 feet x 20 feet.

This system can be used to protect concrete barrier, hazards in gore areas, lighting and sign structures, bridge parapets, and as a stand-alone system. Transition elements are required for use with single and double-faced guardrail and when placed where there is a potential for a backside impact. This system should be used in areas where minimal impacts are anticipated (one impact every three or more years).

Requirements

The area in front of the system will have a slope of 10:1 or less and be free of any obstacles for a minimum of 50 feet. The slope to the sides of the system, from any travel lane, will be no greater than 10:1 and be free of any obstacles Refer to UDOT STD DWG CC 4. When system is installed in a bi-directional application a transition will be installed to accommodate a backside impact as per Standard Specification 02843. Transition elements are required for use with single and double-faced guardrail. **Theses System will be installed on a concrete pad to meet manufacture's requirements for permanent installation. Designer does not need to specify concrete pad requirements.**

See manufacturer's specifications for pad, backup and transition requirements. This system uses rip plates of varying gage, it is critical the proper rip plate is installed in the correct position. The manufacturer, supplier, or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD. DWG CC 1. The object marker plate and marker post will not be a separate pay item and must be installed in all application.

See STD DWG CC 2, Plan A2 or STD DWG CC 3 Guideline B, where drainage requirements are needed.

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Type C (3 approved systems)

SYSTEMS OF THIS TYPE HAVE BEEN CLASSIFIED BY FHWA AND THE AASHTO ROADSIDE DESIGN GUIDE AS W-BEAM MEDIAN TERMINAL

PRIMARILY TO PROTECT NARROW HAZARDS, 24 INCHES OR LESS WITH AVAILABLE RECOVERY AREA. THESE SYSTEMS ARE GATING. TYPICALLY USED WITH MEDIAN W-BEAM GUARDRAIL OR CONCRETE MEDIAN BARRIER WITH A W-BEAM GUARDRAIL MEDIAN TRANSITION. SYSTEMS REQUIRE A RECOVERY AREA. REFER TO STD. DWG. CC SERIES FOR ROADWAY DESIGN GUIDANCE. SYSTEMS HAVE BEEN INCORPORATED AS PART OF THE ANCHORAGE SYSTEM FOR CABLE BARRIER SYSTEMS. REFER TO STANDARD DRAWINGS BA 5 SERIES FOR USE WITH HIGH TENSION CABLE BARRIER SYSTEMS. APPLICATION SHOULD MEET THE REQUIREMENTS OF THE APPLICABLE CC SERIES STANDARD DRAWING.

Name: BRAKEMASTER® 350, from Energy Absorption Systems

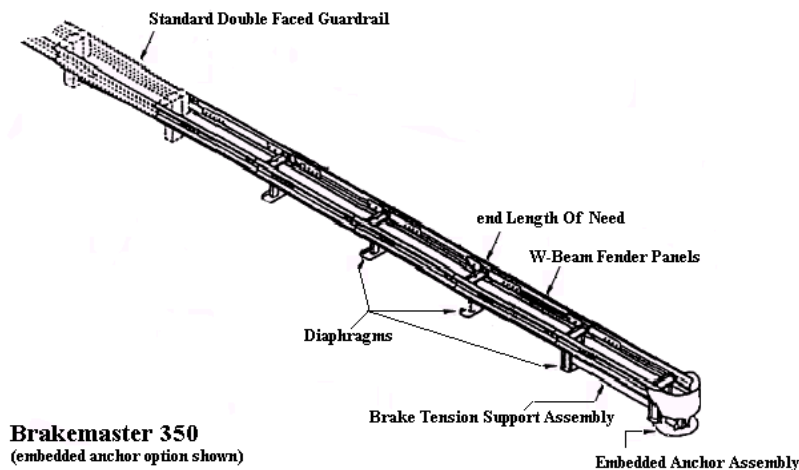
http://energyabsorption.com/products/products_brakemaster350_crash.asp

Local supplier: Interwest Safety Supply, Inc. Provo, Utah phone: (801) 375-6321

<http://www.interwestsafety.com/>

Sales Consultants: Dave Kranz e-mail: dkrantz@iwsafety.com

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Length and NCHRP Test Level:

System Length *	NCHRP Test Level
31 feet 6 inches	TL-3 may be used at any speed

Width: 2 feet 1 inch

Front Anchor Option:

This system is available with an embedded concrete anchor assembly, or a two-foundation tube anchor assembly. Both anchor assemblies are acceptable.

Length of Need: Starting at diaphragm # 3, 16 feet from front of system

Characteristics:

Gating, re-directive, bi-directional, uni-directional. This system rides above the ground and has no post. When this system is impacted head-on the braking system engages controlling the deceleration of the impacting vehicle to dissipate the energy of the impacting vehicle. This system has many parts that can be reused after impact; inspection should be completed prior to ordering replacement parts.

Application:

Shoulder: For fixed objects within 15 feet of the traveled lane and a width 24 inches or less, and where there is a minimum of 100 feet of clear area in front of hazard (125 feet when a transition element required to attach system to bridge parapet or concrete barrier). **May be installed on concrete or asphalt pad. Refer to CC 5A for pad requirements**

Median: Refer to UDOT STD DWG CC 5A for specific recovery area requirements and grading requirements. May be installed on concrete or asphalt pad, Refer to CC 5A for pad requirements.

Requirements:

Transition requirements change for concrete barrier and bridge parapet, see manufacturer's specifications for proper transition element. The system attaches directly to double-faced guardrail, with a minimum of 25' tangent barrier, refer to UDOT STD DWG CC 5A. Refer to manufacturer's installation instructions for front anchor assembly requirements. The approach to the front of the system requires a slope of no greater than 10:1 for a length of 50 feet, and is free of any obstacles. The approach slope from the travel lane(s) to the side(s) of the system is required be no greater than 10:1 and be free of any obstacles. The recovery area behind the system will not be less than 75 feet x 20 feet, and on a slope no greater than 4:1, refer to UDOT STD DWG CC series. The manufacturer, supplier or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD DWG CC 1. The object marker plate and marker post will not be a separate pay item and must be installed in all applications.

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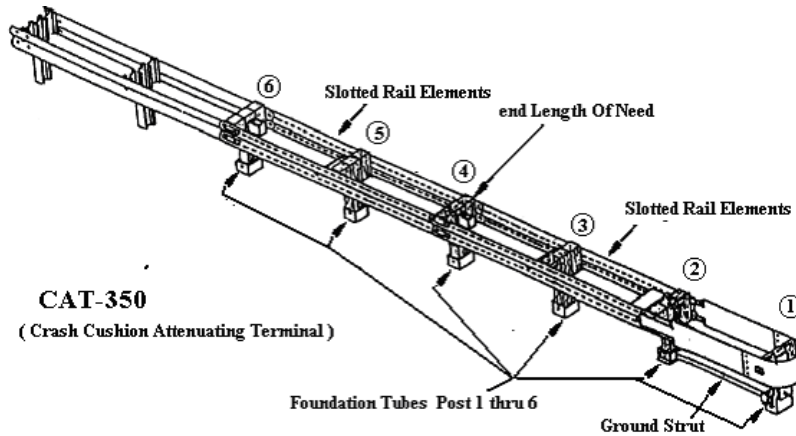
Type C (continued)

Name: C.A.T. 350™ from, Trinity Highway Products, Inc.

<http://www.highwayguardrail.com/products/cat350.html>

Local supplier: Trinity Highway Products, Centerville, Utah phone: (801) 292-4461

Sales Consultant : Jonathan Nordquist, email jonathan.nordquist@trin.net



Length and NCHRP Test Level:

System Length	NCHRP Test Level
31 feet 3 inches (one length only)	TL-3 may be used at any speed

Width: 2 feet 1 inch

Length of Need: Starting at post # 4, 18 feet 9 inches from front of system

Post Option:

Posts 1 - 6: 6' foundation tube with shortened breakaway posts; post 1 is a special ½ post for this system.

Characteristics

Gating, re-directive, bi-directional, and unidirectional. When this system is impacted head-on the slotted guardrail is forced over bolts, which shear the rail. This shearing dissipates the energy of the impact, along with the shortened wood breakaway posts. Soil tubes required. This is a sacrificial system; many of the components must be replaced after an impact.

Applications

Shoulder: For fixed objects within 15 feet of the traveled lane and a width 24 inches or less and where there is a minimum of 100 feet of clear area in front of hazard (150 feet when a transition element is required to attach system to bridge parapet or concrete barrier). The approach to the front of the system requires a slope of no greater than 10:1 for a length of 50 feet, and free of any obstacles. The approach slope from the travel lane to the side of the system is required be no greater than 10:1 and be free of any obstacles. The recovery area behind the system will not be less than 75 feet x 20 feet, and on a slope no greater than 4:1.

Median: Refer to UDOT STD DWG CC 5B for specific recovery area requirements and grading requirements. May be installed on compacted untreated base surfaces.

Requirements

Transition requirements are different for concrete barrier and w-beam barrier attachments. See UDOT Standard Drawings CC and BA series for requirements. The system attaches directly to single and double-faced guardrail. The manufacturer, supplier or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD DWG CC 1. The object marker plate and marker post will not be a separate pay item and must be installed in all applications.

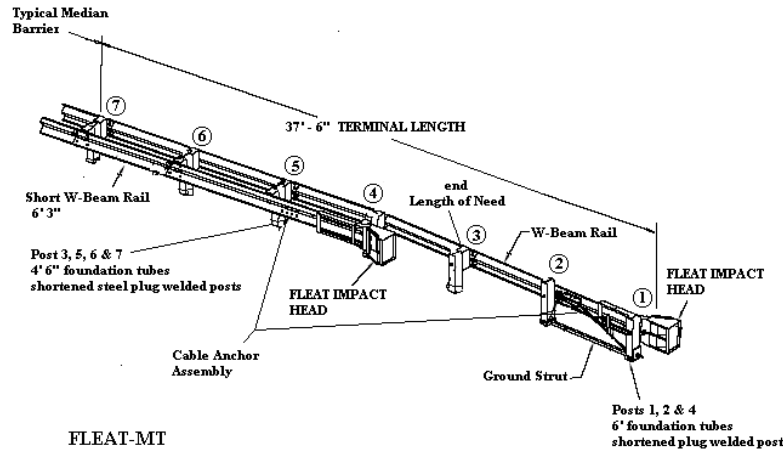
Type C (continued)

Name: FLEAT-MT from Road Systems Inc., www.roadsystems.com,

Local supplier: Universal Industrial Sales, Pleasant Grove, Utah phone: (801) 785-0505

<http://www.universalindustrialsales.com/>

Kevin Davidson, Sales, e-mail kevin@uismail.com



Length and NCHRP Test Level:

System Length	NCHRP Test Level
37 feet 6 inches (one length only)	TL-3 may be used at any speed

Width: 14 inches @ lead impact head, 41 inches @ trailing impact head

Length of Need:

Starting at post # 3, 12 feet 6 inches from front of system

Post Option:

Posts 1, 2, & 4: 6' foundation tube with shortened steel plug welded post.

Posts 3, 5, 6, & 7: 4' 6" foundation tube with shortened steel plug welded posts

Characteristics

Re-directive, unidirectional, gating. The impact heads slides over the slotted rail elements, the head kinks the rail element, absorbing the energy from the impacting vehicle, and the rail is pushed out the front side of the heads. The cable anchor assemblies are attached to the first rail element after each of the impact heads using shoulder bolts.

Applications

Median: Refer to UDOT STD DWG CC 5C for specific recovery area requirements and grading requirements. May be installed on compacted untreated base surfaces.

Requirements

Transition required for concrete barrier and bridge parapet. The system attaches directly to double-faced guardrail. The manufacturer, supplier or installer of the system will provide the appropriate directional object panel, one for each impact head, and marker posts, UDOT STD DWG CC 1. The object marker plate and marker post will not be a separate pay item and must be installed in all applications.

Type D: (2 approved systems) TYPE D SYSTEMS

SYSTEMS OF THIS TYPE HAVE BEEN CLASSIFIED BY FHWA AND IN THE AASHTO ROADSIDE DESIGN GUIDE AS LOW MAINTENANCE AND/OR SELF-RESTORING CRASH CUSHIONS.

PRIMARILY TO PROTECT FIXED HAZARDS, WITH LIMITED RECOVERY AREA, AND HAVE A HIGH PROBABILITY OF IMPACT. HIGHLY RECOMMENDED FOR USE IN GORE AREAS, MAJOR HIGHWAY SPLITS OR IN MEDIAN BARRIER APPLICATION.

THESE SYSTEMS CAN BE USED ON LIMITED BASIS IN A SHOULDER APPLICATION FOR THE PROTECTION OF BARRIER ENDS WHEN THE RECOVERY AREA OR THE APPROACH AREA FOR AN APPROVED END TREATMENT CANNOT BE PROVIDED OR CONDITIONS LISTED BELOW HAVE BEEN MET. DO NOT REDUCE LENGTH OF NEED REQUIREMENTS WHEN THERE IS ROADSIDE RECOVER AREA AVAILABLE. REFER TO STANDARD DRAWINGS CC SERIES.

THE FOLLOWING SHOULD BE ANALYZED PRIOR TO SPECIFYING A SYSTEM OF THIS TYPE:

1. A POSTED OR 85TH PERCENTILE SPEED GREATER THAN 45 MPH
2. DESIGN YEAR AADT GREATER THAN 25,000 AND SYSTEM IS PLACED 12 FEET OR LESS MEASURED FROM EDGE OF TRAVEL LANE TO TRAFFIC SIDE OF SYSTEM.
3. NEW CONSTRUCTION OR ROADWAY MODIFICATIONS, WHERE THE DESIGN SPEED IS GREATER THAN 45 MPH AND A SIMILAR SITE GEOMETRY OR CONDITIONS MAY PRODUCE VEHICLE/CRASH CUSHION IMPACTS AS STATED IN LINE 4.
4. A DOCUMENTED HISTORY OF VEHICLE/CRASH CUSHION IMPACTS, TWO OR MORE IMPACTS OVER A 36 MONTH PERIOD.

DEVIATION FROM THESE CONDITIONS MUST BE APPROVED BY CENTRAL TRAFFIC & SAFETY

DESIGNERS WILL DESIGNATE HAZARD WIDTH ON PLAN SET

Name: Smart Cushions Innovations (SCI) 100, from Work Area Protection Corporation

<http://www.workareaprotection.com/attenuator.htm>

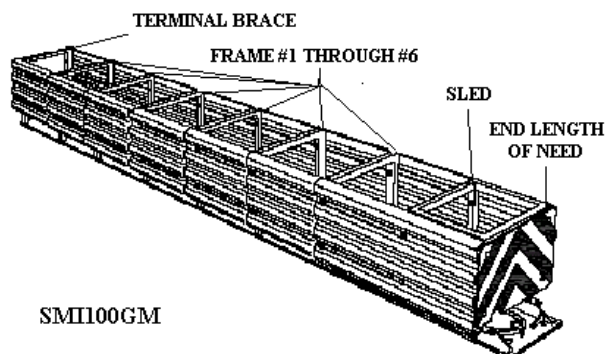
Local supplier: Intermountain Traffic Safety, Inc. Salt Lake City, Utah phone: (801) 972-6515

Sales Consultant: Mike Knaras email: mike@it-safety.com

SCI Products Inc., St. Charles, IL

Roger Alfrey, Western Regional Manager,

phone: 801-330-4324, or 800-327-4417 email: ralfrey@sciproductionsinc.com



This system is approved for use as a Type A, Type B and /or Type D system.

Use and approval as a Type D system is based on Department's evaluation of repair records as submitted to FHWA in an in-service evaluation report.

This system length is 21 ft. 6 inches and requires the use of additional transition panels and spanner posts to exceed 27 inch width. Designer should use care when designing for this system in locations with a hazard width greater than 27 inches to include the appropriate length using the required number of transition panels and spanner post to meet hazard width requirements. Additional transition panels and spanner post will be paid for as part of the system; no additional payment will be made. **This System will be installed on a concrete pad to meet manufacture's requirements for permanent installation. Designer does not need to specify concrete pad requirements**

Type D (continued)

Name: QuadGuard® ELITE, from Trinity Highway Products, Inc

http://www.energyabsorption.com/products/products_quadguard_elite.asp

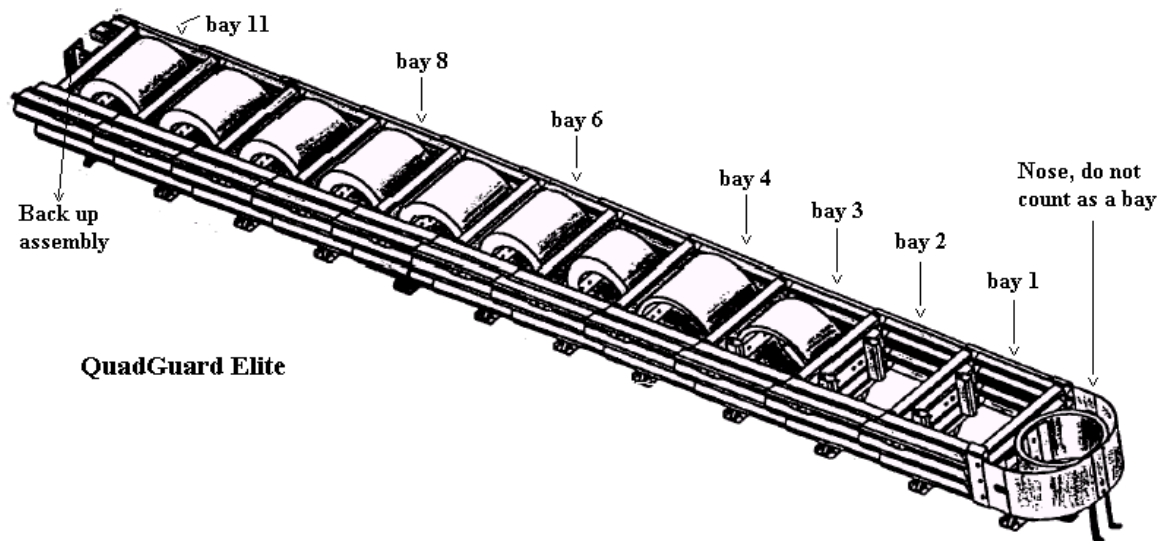
Local supplier: Interwest Safety Supply, Inc, Utah phone: (801) 375-6321

Sales Consultant: Dave Krantz email: dkrantz@iwsafety.com

Trinity Highway Products

Sales Consultant: Jonathan Nordquist

phone: 801-292-4461 email: jonathan.nordquist@trin.net



Length: Varies with speed requirements, see test level below.

Width: Five standard widths: 24 inches, 30 inches, 36 inches, 60 inches, and 90 inches. The 60 inch and 90 inch systems flare out on both sides to obtain the required width at backup.

Designers will designate hazard width on plan set.

NCHRP Test Level:

TL-2, < 45 mph	7 bays, length 21 feet 6 inches
L-3, > 45 mph	8 bays, length 26 feet 1 inch

Length of Need:

From beginning of system

Characteristics

Re-directive, bi-directional, unidirectional, non-gating, non-pocketing. This system uses polyethylene cylinders, of varying wall thickness, which compress upon impact absorbing the energy from the impacting vehicle. The cylinders will return to their original shape after system is reset. Bays 1 and 2 do not have cylinders. The fender panels redirect an impacting vehicle. This system can withstand multiple impacts with minimal repair.

Application

To protect fixed objects near the traveled lane(s), with width up to 90 inches. The approach to the front of the system will have a slope of 1:10 or less and be clear of any obstructions for a minimum of 50 feet. The approach slopes on either side of the system will be 1:10 or less. Refer to UDOT STD DWG CC 4.

This system should be used in areas where at least one impact per year is anticipated, or when repair history indicates two or more impacts over a three-year period. **Theses System will be installed on a concrete pad to meet manufacture's requirements for permanent installation. Designer does not need to specify concrete pad requirements.**

Requirements

See manufacturer's specifications for pad, backup and transition requirements. See STD DWG CC 2, Plan A2 or STD DWG CC 3, where drainage requirements are needed. The manufacturer, supplier or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD DWG CC 1. The object marker plate and marker post will not be a separate pay item and must be installed in all application.

Note: The QuadGuard Elite and QuadGuard LMC are similar in appearance; the difference is the material the cylinders are manufactured with.

The cylinders from the QuadGuard Elite may be used to upgrade the standard QuadGuard systems (Types A and B) when required.

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See Type A or Type B systems for use and installation requirements.

Type E- (3 approved systems)

Sand Barrel Arrays

PRIMARILY TO PROTECT HAZARDS A MINIMUM OF 15 FEET FROM TRAVEL LANE WITH AVAILABLE RECOVERY AREA. THIS IS A GATING, NON-REDIRECTIVE CRASH CUSHION SYSTEM. THIS SYSTEM IS A HIGH MAINTENANCE SYSTEM; IT IS RECOMMENDED THIS SYSTEM ONLY BE USED WHEN OTHER SYSTEMS CANNOT BE PLACED, AND ONLY IN AREAS WHERE SNOW CLEARING OPERATIONS WILL NOT CAUSE DAMAGE. APPLICATION SHOULD MEET THE REQUIREMENTS OF THE APPLICABLE CC SERIES STANDARD DRAWING. **DO NOT USE THIS SYSTEM TO PROTECT BRIDGE COLUMNS OR PIERS.**

Name: Three approved manufacturers.

1. “Big Sandy” Traffix Devices Inc.

<http://www.traffixdevices.com/cgi-local/SoftCart.exe/bigandy.htm?L+scstore+vfcc0398ff240924+1355010643>

Local supplier: Safety Supply & Sign Co. Inc. Salt Lake City, Utah phone: (801) 973-2266

Sales Consultant: Carvel Anderson email: carvel@safetysupplyandsign.com

2. Energite® III Barrels, Energy Absorption Systems

http://energyabsorption.com/products/products_energite_iii.asp

Local supplier: Interwest Safety Supply, Inc. Provo, Utah phone: (801) 375-6321

<http://www.interwestsafety.com/>

Sales Consultants: Dave Krantz e-mail: dkrantz@iwsafety.com

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3. Fitch Universal Barrels, Energy Absorption Systems

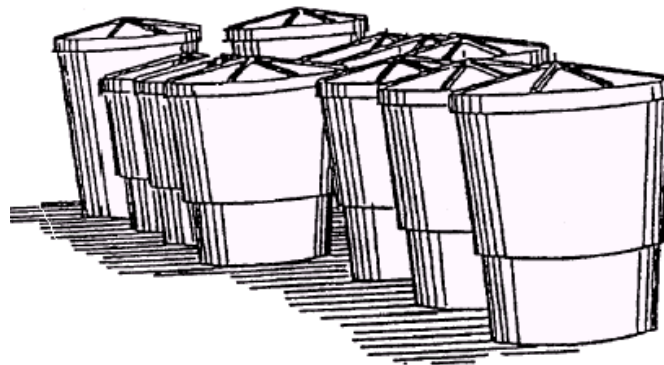
http://energyabsorption.com/products/products_universal_barrels.asp

Local supplier: Interwest Safety Supply, Inc. Provo, Utah phone: (801) 375-6321

<http://www.interwestsafety.com/>

Sales Consultants: Dave Kranz e-mail: dkrantz@iwsafety.com

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Sand Barrels

Length: Variable

Width: Variable

Designers will designate hazard width on plan set.

NCHRP Test Level: TL-1, TL-2, TL-3

Design system to meet roadway design speed.

Length of Need: Variable

Use Energite III Design Manual when designing this system.

Available from Division of Traffic & Safety

Characteristics

Non-re-directive, uni-directional, bi-directional, gating, pocketing. This system uses plastic container filled with varying amounts of sand, which transfers and dissipates the energy from an impacting vehicle.

Application

Use to protect fixed objects outside 15 feet of the traveled lane.

Requirements

Refer to UDOT STD DWG CC 6 for pad and placement requirements. The approach slope to the front of the system will be no greater 20:1 and free any obstacles for a length of 50 feet prior to the first barrel. **Barrel arrays will be placed on concrete or asphalt pad. Designer should specify desired pad requirements. Refer to Std. Dwg. CC 6**

Median Installation

The approach slope to the front, sides, and back of the installation, from any travel lanes will be no greater than 10:1 and be free of any obstacles.

Shoulder Installation

The approach slope to the front, sides, of the installation, from the approach travel lanes will be no greater than 10:1 and be free of any obstacles. The required recovery area behind the system is 75 feet X 20 feet, and on a slope no greater than 4:1.

Use Energite III Design Manual when designing this system (available from Division of Traffic & Safety). The manufacturer, supplier or installer of the system will provide the appropriate directional object panel UDOT STD DWG CC 1. The object marker plate will not be a separate pay item and must be installed in all application.

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Type F: (2 approved systems)

SYSTEMS OF THIS TYPE HAVE BEEN CLASSIFIED FHWA AND THE AASHTO ROADSIDE DESIGN GUIDE AS SACRIFICIAL CRASH CUSHIONS.

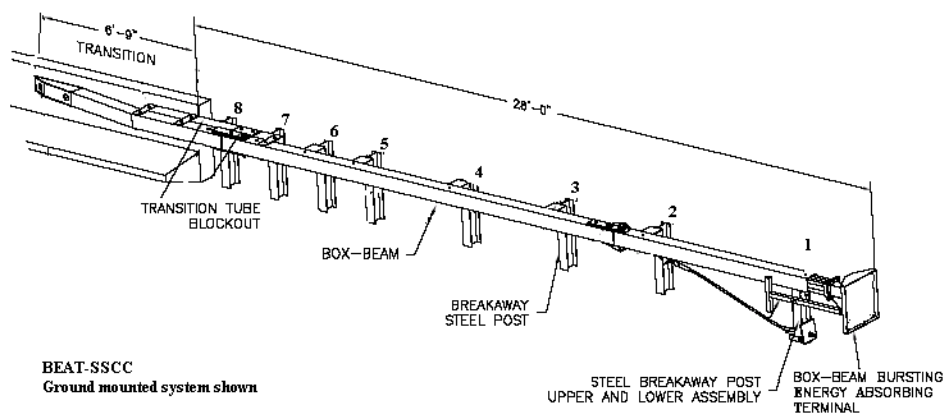
PRIMARILY TO PROTECT CONCRETE BARRIER ENDS AND BRIDGE PARAPETS WITH LIMITED LONGITUDINAL SPACE AND AVAILABLE RECOVERY AREA. SYSTEMS OF THIS TYPE ARE GATING AND REDIRECTIVE SYSTEMS. APPLICATION SHOULD MEET THE REQUIREMENTS OF THE APPLICABLE CC SERIES STANDARD DRAWING.

Name: BEAT-SSCC from Road Systems Inc., <http://www.roadsystems.com/beat-sscc.html>

Local supplier: Universal Industrial Sales, Pleasant Grove, Utah phone: (801) 785-0505

<http://www.universalindustrialsales.com/>

Kevin Davidson, Sales, e-mail kevin@uismail.com or Jim Fowers, Sales, e-mail jfowers@uismail.com

**Length:**

28 feet

Width:

18 inches @ impact head

NCHRP Test Level:

TL-3, may be used at any speed limit

Length of Need:

Starting at post # 3

Characteristics

Re-directive, unidirectional, gating. The impact heads slides into the box beam elements and splits the beam; dissipate the energy from an impacting vehicle.

The system uses ground mounted steel breakaway post or surface mounted steel posts.

Applications

Use to protect concrete barrier and bridge abutments with longitudinal space of less than 125 feet in front of hazard.

Requirements

System attaches directly to concrete barrier or bridge parapet. Use only manufacturer's supplied ground mounted breakaway or surface mounted posts. **Surface mounted systems will meet manufacture's pad requirements for installation. Designer does not have to specify concrete pad requirements.** Install post as per manufacturer's requirements. Slopes of 10:1 or less are required to the front and side approaches, and be free of obstacles. Refer to UDOT STD DWG CC 7B Crash Cushion Type "F" for recovery area and slope requirements behind the system. The manufacturer, supplier or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD DWG CC 1. The object marker plate and marker post will not be a separate pay item and will be installed in all applications.

Type F (continued)

Name: QuadTrend 350™ from Energy Absorption Systems

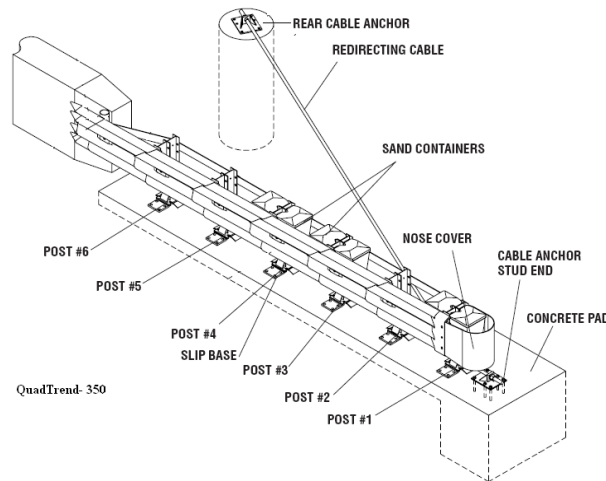
http://energyabsorption.com/products/products_quadtrend350_end.asp

Local supplier: Interwest Safety Supply, Inc. Provo, Utah phone: (801) 375-6321

<http://www.interwestsafety.com/>

Sales Consultants: Dave Kranz e-mail: dkrantz@iwsafety.com

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Length: 21 feet

Width: 1 foot 3 inches

NCHRP Test Level: TL-3, may be used with any speed.

Length of Need: Starting at post # 3, 7 feet 6 inches from front of system (nose piece)

Characteristics:

Re-directive, uni-directional, gating. This system is equipped with a slip base steel post and sand containers, which work in conjunction with one another to dissipate the energy from an impacting vehicle.

Application:

Use to protect concrete barrier and bridge abutments with longitudinal space of less than 125 feet in front of hazard.

Requirements:

Construct concrete pad as per manufacturer's requirements. Use manufacturer's requirements for installing redirecting cable and cable anchor. **Designer does not have to specify concrete pad or rear anchor block requirements.** Redirecting cable anchor will be positioned in such a manner as to allow the redirecting cable to lay flat on the ground. Slopes of 10:1 or less are required to the front and side approaches, and be free of obstacles. Refer to UDOT STD DWG CC 7A Crash Cushion Type "F" for recovery area requirements behind the system, and redirecting cable anchor requirements.

When system is installed with New Jersey shaped barrier a barrier modification is required. See Standard Drawing CC 7A for this modification.

The manufacturer, supplier or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD DWG CC 1. The object marker plate and marker post will not be a separate pay item and must be installed in all applications.

Type G: TANGENT TERMINALS (2 approved systems)

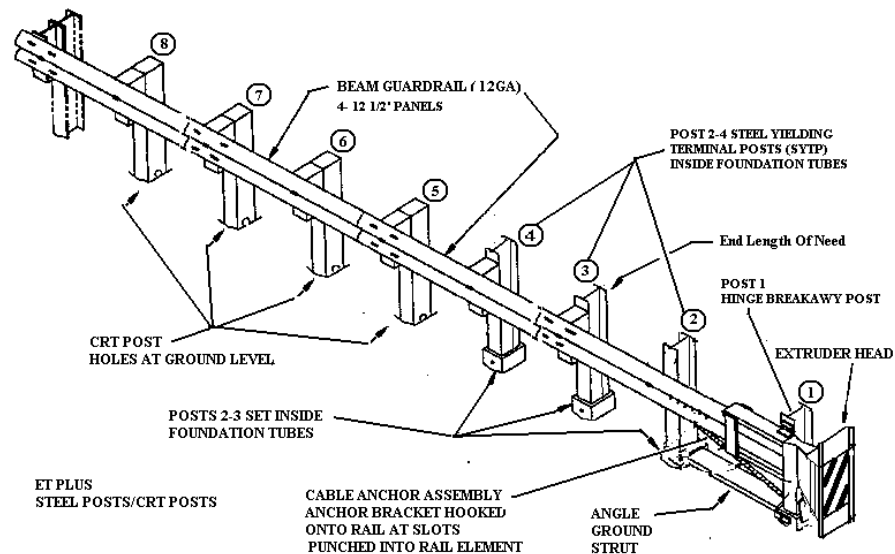
PRIMARILY TO PROTECT GUARDRAIL BARRIER ENDS ON TANGENT OR FLARED W-BEAM INSTALLATIONS WITH AVAILABLE RECOVERY AREA. USED TO PROTECT CONCRETE BARRIER ENDS AND BRIDGE PARAPETS WHEN A W-BEAM TRANSITION ELEMENT IS USED. SYSTEMS ARE GATING AND REDIRECTIVE. MEET REQUIREMENTS OF STD. DWG. CC 8 SERIES

Name: ET-PLUS™ from, Trinity Highway Products, Inc.

<http://www.highwayguardrail.com/products/etplus.html>

Local supplier: Trinity Industries, Inc. Centerville, Utah phone: (801) 292-4461

Sales Consultant : Jonathan Nordquist, email jonathan.nordquist@trin.net



Length: 50 feet

Width: 1 foot 8 inches (extruder head)

NCHRP Test Level: TL-3, may be used with any speed.

Length of Need: starting with post #3, 12 feet 6 inches from front of system

Offset:

When used on a tangent barrier installation a 2-foot (25:1) straight-line flare over the length of the system required.

Characteristics

Re-directive, unidirectional, gating. Extruder head flattens the rail, which is pushed out the backside of the head. The cable box anchor assembly is hung on the first rail element using rectangular slots punched into the rail element. The extruder head chute **does not** extend to the cable box assembly attachment point. The extruder head appears to be solid.

Application

Single faced guardrail may be attached to bridge parapet or concrete barrier using a transition element, refer to STD DWG BA 4 series. This system can be used with tangent or flared barrier installations.

Requirements

W-Beam Rail element: 4- 12½' w-beam guardrail elements. Each rail element punched and drilled as per manufacturer's requirements. First rail element punched and drilled as per manufacturer's requirements. Rail panels 2-4 standard w-beam rail elements.

Line Post for new construction:

Steel post: Installation will use a Hinged Breakaway steel post (HBA™), and Steel Yielding Terminal Posts (SYTP) as specified by the manufacturer at the location indicated below.

Posts 1: lower section of Hinged Breakaway posts (HBA™) is 71½ inches in length, upper post is 28 inches in length. The post sections are bolted together. Hinge joint will be placed a maximum of 1 inch above ground line. Hinge section of post will not be placed below ground level. Post block not required at posts 1. Angle ground strut required between posts 1 and 2.

Posts 2: shortened Steel Yielding Terminal Post (SYTP) set into 6-foot foundation tube, no blockout.

Post 3 and 4: shortened Steel Yielding Terminal Posts (SYTP) set into 4 foot 6 inch foundation tubes. **The top of the foundation tubes will not be more than 4 inches above the ground line.**

Notched wood or composite blocks are required at posts 3 and 4.

Use only manufacturer specified Steel Yielding Terminal Posts (SYTP).

Posts 5 through 8: standard wood Controlled Release Terminal (CRT) posts.

The Hinged Breakaway Post (HBA™) and Steel Yielding Terminal Posts (SYTP) used with this system cannot be substituted with any other type of steel breakaway post.

Transition required, as per UDOT STD DWG BA 4B for attachment to concrete barrier or bridge parapet, which will add a length of 25 feet to the installation. System will be installed with a 25:1 offset over the 50-foot length of the system. This will keep the extruder head from encroaching onto the shoulder of the roadway. The 25:1 offset may start at the connection point of the transition element if installed onto concrete barrier or bridge parapet.

Refer to UDOT STD DWG CC 8A and CC 8B Crash Cushion Type G for offset requirements, grading requirements and recovery area requirements. The manufacturer, supplier or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD DWG CC 1.

Repair options: existing ET 2000 and ET Plus

Option 1: system with 8 foundation tubes

1. Post 1: remove foundation tubes replace with system manufacturer's specified Hinge Breakaway Post (HBA™) and angle ground strut, or replace post with manufacturer's specific CRP Retro Post, which installs into foundation tube.
2. Posts 2 through 8: replace damaged shortened wood posts with system manufacturer's specified shortened Steel Yielding Terminal Post (SYTP).
 - a. Replace wood blocks with notched wood or composite block.
3. If some of the existing wood posts are serviceable move to rear of system. Place steel post together near front of system.
 - a. Replace wood blockout as needed.
4. Replace damaged rail elements with 12½' rail elements.
 - a. First rail element punched and drilled as per manufacturer's requirements.

Option 2: systems with 4 foundation tubes

1. Post 1: remove foundation tubes replace with system manufacturer's specified Hinge Breakaway Post (HBA™) and angle ground strut, or replace post with manufacturer's specific CRP Retro Post, which installs into foundation tube.
2. Posts 2 through 4: replace damaged shortened wood posts with system manufacturer's specified shortened Steel Yielding Terminal Post (SYTP).
 - a. If some of the existing wood posts are serviceable move to rear of system. Place steel post together near front of system.
 - b. Replace wood blocks with notched wood or composite block.
3. Post 5 through 8: replace standard wood Controlled Release Terminal (CRT) posts in kind.
 - a. Replace wood blocks as needed.
4. Replace damaged rail elements with 12½' rail elements.
 - a. First rail element punched and drilled as per manufacturer's requirements.

ET/Plus: with steel posts and standard wood Controlled Release Terminal (CRT) posts

Option:

1. Post 1: repair/remove damaged hinged breakaway post
 - a. Replacement made with system manufacturer's specified post only (HBA).
2. Post 2 and 4: replace damaged shortened Steel Yielding Terminal Post (SYTP). Replace damaged foundation tube if required
 - a. Replace steel post with manufacturer's specified Steel Yielding Terminal Post (SYTP) only.
 - b. Replace wood blocks as needed.
3. Post 5 through 8: replace with standard wood Controlled Release Terminal (CRT) posts.
 - a. Replace wood blocks as needed.
4. Replace damaged rail elements with 12½' rail elements.
 - a. First rail element punched and drilled as per manufacturer's requirements.

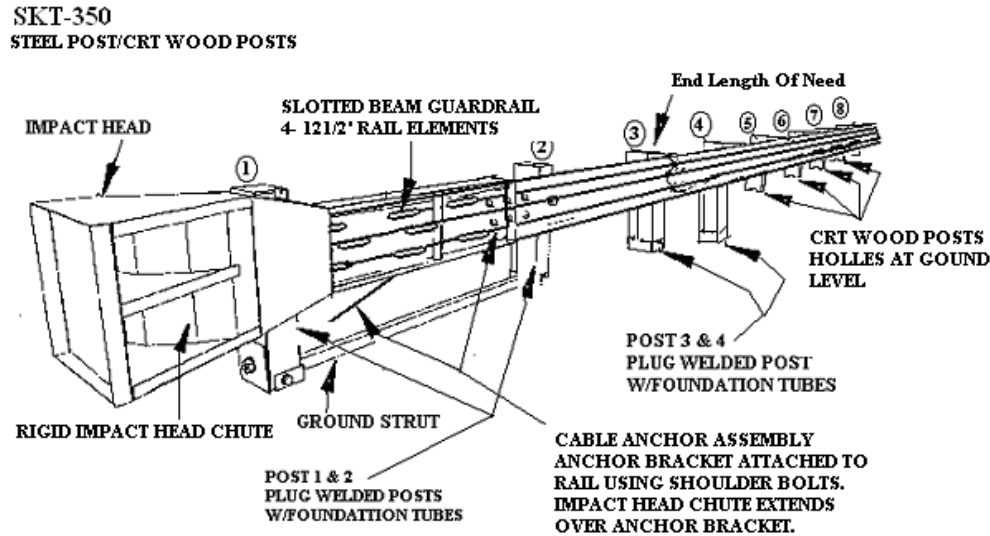
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Type G (continued)

Name: SKT-350 from Road Systems Inc., <http://www.roadsystems.com/skt.html>

Local supplier: Universal Industrial Sales, Pleasant Grove, Utah phone: (801) 785-0505
<http://www.universalindustrialsales.com/>

Kevin Davidson, Sales consultant e-mail kevin@uismail.com or Jim Fowers, Sales, e-mail jfowers@uismail.com



Length: 50 feet

Width: 1 foot 8 inches @ impact head

NCHRP Test Level: TL-3 may be used with any speed.

Length of Need: Starting with post #3, 12 feet 6 inches from front of system.

Offset:

When used on a tangent barrier installation a 2-foot straight-line flare (25:1) over the length of the system required.

Characteristics

Re-directive, unidirectional, gating. Impact head kinks the rail element, which is pushed out the backside of the head. The cable box anchor assembly is attached to the first rail element using shoulder bolts and sliding over the bolts. The impact head chute extends to the cable box assembly attachment point. The impact head is attached to the chute assembly leaving an open space between the face of impact head and chute.

Application

Single faced guardrail may be attached to bridge parapet or concrete barrier using a transition element, refer to STD DWG BA 4 series. This system can be used with tangent or flared barrier installations.

Requirements

W-Beam Rail element: 4- 12 1/2' w-beam guardrail elements. First rail element punched and drilled as per manufacturer's requirements. Panels 2 through 4, standard 12 1/2' w-beam guardrail.

Line Post for new construction:

Steel post: Installation will use steel plug welded and standard wood Controlled Release Terminal (CRT) posts as specified by the manufacturer at the location indicated below.

This system uses W6 X 8.5 X 45" steel plug welded posts.

Post 1 and 2: 6' 0" foundation tubes, with 45" steel plug welded posts, no blockouts

Post 3 and 4: 4' 6" foundation tubes, with 45" steel plug welded posts, notched wood or composite blockouts.

Posts 5 through 8: standard wood Controlled Release Terminal (CRT) posts with blockouts.

Transition required, as per UDOT STD DWG BA 4B for attachment to concrete barrier or bridge parapet, which will add a length of 25 feet to the installation. System will be installed with a 25:1 offset over the 50-foot length of the system; this will keep the impact head from encroaching onto the shoulder of the roadway. The 25:1 offset may start at the connection point of the transition element if installed onto concrete barrier or bridge parapet. Refer to UDOT STD DWG CC 8A and CC 8B Crash Cushion Type G for offset requirements, grading requirements and recovery area requirements. The manufacturer, supplier or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD DWG CC 1.

Repair options: SKT-350 systems

Systems with all wood posts and 4 foundation tubes:

1. Post 1 through 4: replace damaged posts with shortened plug welded post.
 - a. Use manufacturer's specified plug welded post only.
 - b. If some of the existing shortened wood posts are serviceable move to rear of system. Place steel post together near front of system
 - c. Replace wood blocks as needed.
2. 5 through 8: replace standard wood Controlled Release Terminal (CRT) posts in kind.
 - a. Replace wood blocks as needed.
3. Replace damaged rail elements with 12½' rail elements.
 - a. First rail element punched and drilled as per manufacturer's requirements.

Systems with plug welded posts and standard wood Controlled Release Terminal (CRT) posts.

1. Post 1 through 4: replace damaged shortened plug welded post with manufacturer's specified post.
 - a. Replace wood blocks as needed.
 2. 5 through 8: replace standard wood Controlled Release Terminal (CRT) posts in kind.
 - a. Replace wood blocks as needed.
 3. Replace damaged rail elements with 12½' rail elements.
 - a. First rail element punched and drilled as per manufacturer's requirements.
-

Type H: FLARED End Treatments (2 approved systems)

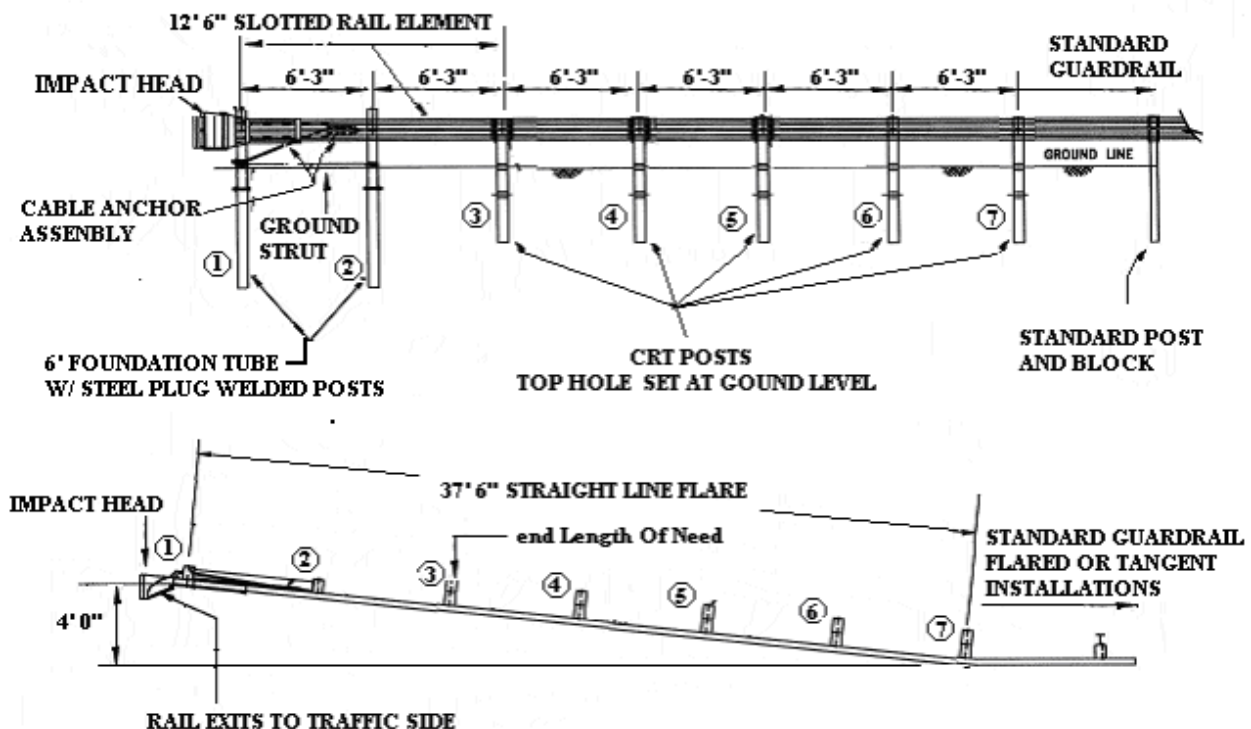
PRIMARILY TO PROTECT GUARDRAIL BARRIER ENDS ON TANGENT OR FLARED W-BEAM INSTALLATIONS WITH AVAILABLE RECOVERY AREA. CAN BE USED TO PROTECT CONCRETE BARRIER ENDS AND BRIDGE PARAPETS WHEN A W-BEAM TRANSITION ELEMENT IS USED. SYSTEMS ARE GATING AND REDIRECTIVE. MEET REQUIREMENTS OF STD. DWG. CC 9 SERIES

Name: FLEAT-350 from Road Systems, Inc. <http://www.roadsystems.com/fleat.html>

Local supplier: Universal Industrial Sales, Pleasant Grove, Utah phone: (801) 785-0505

<http://www.universalindustrialsales.com/>

Kevin Davidson, Sales Consultant, e-mail kevin@uismail.com



FLEAT -350

Length: 37 feet 6 inches

Width: 14 inches @ impact head

NCHRP Test Level: TL-3, may be used with any speed.

Offset:

When used on a tangent barrier installation a 4 foot straight line flare over the length of the system required.
When system is used on a flared barrier installation, system will be installed at the same flare rate of the barrier installation.

Length of Need: Starting with post #3, 12 feet 6 inches from front of system

Application

Tangent or flared, single faced guardrail installations. When used to protect concrete barrier or bridge parapet, a transition is required as per UDOT STD DWG BA 4 series.

Characteristics

Re-directive, unidirectional, gating. The impact head slides over the rail element and when impacted the head kinks the rail element, absorbing the energy from the impacting vehicle, the rail is then pushed out the front side

of the head. The cable box anchor assembly is attached to the first rail element using shoulder bolts and sliding over bolts.

Requirements

Line Posts for new construction:

Steel post: Installation will use steel plug welded and standard wood Controlled Release Terminal (CRT) posts as specified by the manufacturer at the location indicated below.

This system uses W6 X 8.5 X 45" steel plug welded posts.

Posts 1 and 2: 6' 0" foundation tubes, with 45" steel plug welded posts, no blockouts

Posts 3 through 7: standard wood Controlled Release Terminal (CRT) posts with blockouts

W-Beam Rail element: 3- 12½' w-beam guardrail elements. First rail element punched and drilled as per manufacturer's requirements. Panels 2 through 3, standard 12½' w-beam guardrail.

Transition required, as per UDOT STD DWG BA 4 series, for attachment to concrete barrier or bridge parapet. Refer to UDOT STD DWG CC 9A Crash Cushion Type H for offset requirements, grading requirements and recovery area requirements. The manufacturer, supplier or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD. DWG CC 1.

Repair options: existing FLEAT-350 systems

Wood post system with 2 foundation tubes

1. Post 1 and 2: replace wood posts with shortened plug welded post.
 - a. Use manufacturer's specified plug welded post only.
2. Posts 3 through 7: replace damaged standard wood Controlled Release Terminal (CRT) posts in kind.
 - a. Replace wood blockout as needed.
3. Replace damaged rail elements with 12½' rail elements.
 - a. First rail element punched and drilled as per manufacturer's requirements.

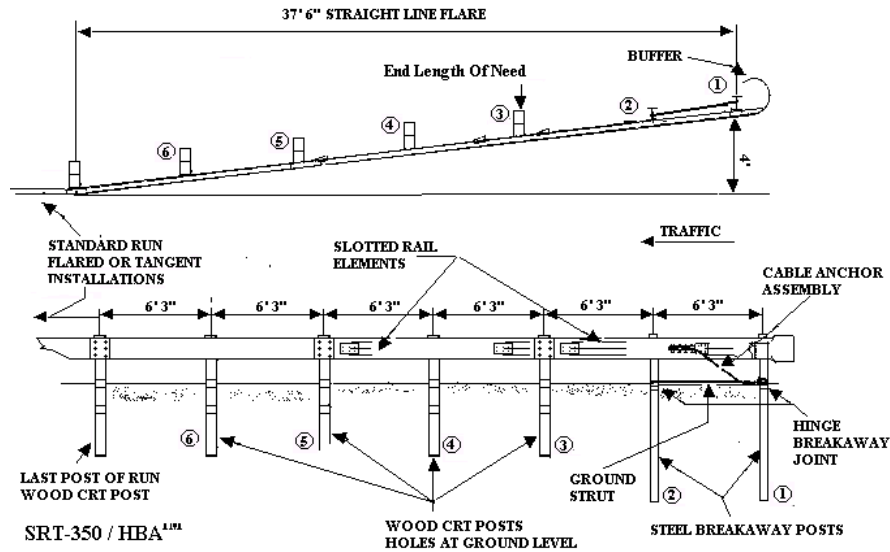
Steel post systems

1. Post 1 and 2: replace damaged plug welded posts.
 - a. Use manufacturer's specified plug welded post only.Post 3 through 7: replace damaged standard wood Controlled Release Terminal (CRT) posts with blockouts in kind.
2. Replace damaged rail elements with 12½' rail elements.
 - a. First rail element punched and drilled as per manufacturer's requirements.

Type H (continued)

Name: SRT™/HBA™ Trinity Highway Products, Inc.
<http://www.highwayguardrail.com/products/et-srt350.html>

Local supplier: Trinity Industries, Inc. Centerville, Utah phone: (801) 292-4461
Sales Consultant : Jonathan Nordquist, email jonathan.nordquist@trin.net



Note: The last line post of the guardrail installation or the last post of the transition element (post 11), at the point of the SRT-350/HBA is connected will be a standard wood Controlled Release Terminal (CRT) post, and is not considered part of the system by the manufacturer. The Department does consider this post part of the system and it will be provided when this system is bid and selected.

Length: 37 feet 6 inches

Width: Width is same as standard guardrail

NCHRP Test Level: TL-3, may be used with any speed.

Offset

When used on a tangent barrier installation a 4 foot straight line flare over the length of the system required.

When system is used on a flared barrier installation the system offset will be 4 foot, measured from the barrier flare rate extended.

Length of Need: Starting with post #3, 12 feet 6 inches from front of system.

Characteristics

Re-directive, uni-directional, gating.

Application:

Single faced guardrail may be attached to bridge parapet or concrete barrier using a transition element, refer to STD DWG BA 4 series. This system can be used with tangent or flared barrier installations. When used with a tangent barrier an offset of 4' from barrier line extended required, when used with a flared barrier system the offset will be 4' from the flared barrier line extended.

Requirements

Line Posts

Posts 1 and 2: use Hinged Breakaway (HBA™) Post as supplied by the manufacturer. The posts are constructed in two pieces and bolted together at the hinge point. The lower sections are 71½ inches in length and the upper section is 43½ inches in length. Post 1 and 2 do not require a block. Angle ground strut required between posts 1 and 2.

The joint of post will be placed a maximum of 1 inch above ground line and will not be placed below ground level.

The Hinged Breakaway Post (HBA™) used with this system cannot be substituted with any other type of steel breakaway post.

Post 3 through 6: standard 72 inch standard wood Controlled Release Terminal (CRT) posts, the bottom of the top hole will be placed at ground level.

Note: The last line post of the guardrail installation or the last post of the transition element (post 11), at the point of the SRT-350/HBA is connected will be a standard wood Controlled Release Terminal (CRT) post, and is not considered part of the system by the manufacturer. The Department does consider this post part of the system and it will be provided when this system is bid and selected.

Transition required, as per UDOT Standard Drawing BA 4 series, for attachment to concrete barrier or bridge parapet. Refer to UDOT Standard Drawing CC 9A, End Section Type H, for grading and recovery area requirements. The manufacturer, supplier or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD. DWG CC 1.

W-Beam Rail element: 3- 12½' w-beam guardrail elements. First and second rail element punched with longitudinal slots and drilled as per manufacturer's requirements. Rail element 3 is standard 12½' w-beam guardrail. Post 2 requires a back up plate.

Repair options: existing SRT/HBA repair as installed.

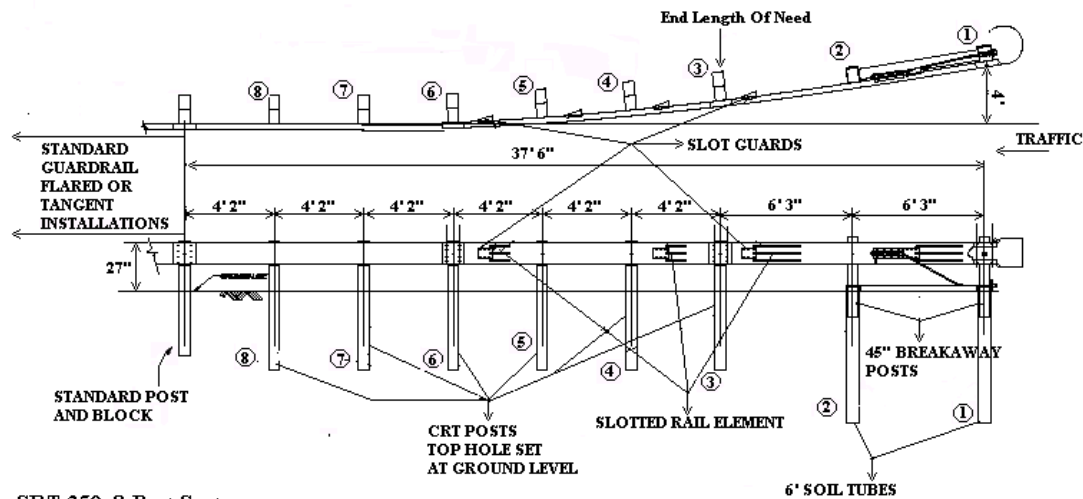
THIS SYSTEM IS INCLUDED IN GUIDE FOR MAINTENANCE PURPOSES. DO NOT INSTALL ON NEW PROJECTS.

Name: SRT-350™ 8 Post System, Trinity Highway Products, Inc.

<http://www.highwayguardrail.com/products/et-srt350.html>

Local supplier: Trinity Industries, Inc. Centerville, Utah phone: (801) 292-4461

Sales Consultant : Jonathan Nordquist, email jonathan.nordquist@trin.net



Length: 37 feet 6 inches

Width: Width is same as standard guardrail

NCHRP Test Level: TL-3, may be used with any speed.

Length of Need: Starting with post #3, 12 feet 6 inches from front of system.

Offset: 4 foot parabolic flare over the length of the system.

Characteristics: Re-directive, uni-directional, gating

Application: Single faced guardrail

Requirements:

Posts 1 and 2: 72 inch foundation tubes with 2, 45-inch wood breakaway posts. Posts 1 and 2 do not require a block. Angle ground strut required between posts 1 and 2.

Posts 3 through 8: standard wood Controlled Release Terminal (CRT) posts, the bottom of the top hole will be placed at ground level.

The foundation tubes will be no greater than 4 inches above ground level.

Transition required, as per UDOT Standard Drawing BA 4B, for attachment to concrete barrier or bridge parapet. Refer to UDOT Standard Drawing CC 9B, End Section Type "H", SRT-350, for grading and recovery area requirements. The manufacturer, supplier or installer of the system will provide the appropriate directional object panel and marker post, UDOT STD. DWG CC 1.

W-Beam Rail element: 3- 12½' w-beam guardrail elements. First and second rail element punched and drilled as per manufacturer's requirements, post 2 requires a back up plate. Panel 3, standard 12½' w-beam guardrail.

Repair options: existing SRT-350 repair as installed.

References

AASHTO Manual for Assessing Safety Hardware (MASH)
NCHRP Report 350 - Recommended Procedures for the Safety Performance Evaluation of Highway Features
NCHRP Report 230 - Recommended Procedures for the Safety Performance Evaluation of Highway Appurtenances
NCHRP Synthesis 205- Performance and Operational Experience of Crash Cushions
Design Construction and Maintenance of Highway Safety Features, NHI, 1997
Guide to Standardized Highway Barrier Hardware, Task Force 13 Report, AASHTO
AASHTO Roadside Design Guide, 2002, 2006, 2011
Barrier Systems, Inc, Design and Installation Manuals
Energy Absorption Systems, Inc., Design and Installation Manuals
Road Systems, Inc, Design and Installation Manuals
SCI Products Inc., Installation and Repair Manual
Trinity Highway Products Inc., Design and Installation Manuals

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Mr. William Fitzgerald, FHWA retired, Baltimore, MD
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Mr. Chuck Norton, Trinity Highway Products Inc., Centerville, UT
Mr. Randy Olson, Trinity Industries, Inc., Centerville, UT
Mr. Dick Powers, formerly FHWA, Washington D.C.
Mr. Jeffery Smith, Work Area Protection, St. Charles IL

Mr. Bryce Sorenson, Interwest Safety Supply, Provo, UT
Mr. Dave Krantz, Interwest Safety Supply, Provo, UT
Mr. Martin Snow, Universal Industrial Sales., Lindon, UT